JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. XCVI., No. 2267.—TUESDAY, OCTOBER 23, 1906.

EDITORIAL NOTES—GAS, &c.

Granton—A Judicious Investment.

IT must have been exceedingly gratifying to Mr. W. R. Herring, the Chief Engineer to the Edinburgh and Leith Corporations' Gas Commissioners, to have received, at the inauguration of the second section of the magnificent works at Granton, such tributes of praise as it was our pleasure to report last week from the leaders of the city in which he lives and labours. They appreciate correctly and to the full the commercial importance of the work that he has done for Edinburgh and Leith during the past decade; and they also recognize—even if they do not appreciate in the same measure that technicians can do—that the commercial success of his work is only the fruit of a great technical success. Some ten years ago he advised that the most economical manner of dealing with a gas-works system whose uneconomical conditions presented no vulnerable point from which to effect palliation, was to "scrap the lot." Scrapping large gas-works is rather a tall order; but "scrap" the works the Commissioners resolved they would do. And to-day they have the satisfaction of incontestably knowing that their Engineer was right in his advice, and that they did a sage thing in accepting that advice. Even from the first section of the works, the economies resulting—though the first section of any new works on a virgin site must always be more costly per unit of output than succeeding ones—were found to be not only sufficient to pay interest and sinking fund charges upon the capital outlay, but also, with an increased rating to the operatives, it was possible to reduce the price of gas by 3d. per 1000 cubic feet to the consumers, which reduction represented £23,500 per annum. Moreover, the balances carried to profit and loss account have exceeded during the past two years all anterior amounts —£91,733 and £91,347; the next highest figure (£82,486) being in 1903, with coal costing about the same as in 1904 and 1905. Verily scrapping has proved to be an economical policy at Edinburgh; and the solid figures quoted are irrefragable, and are such that all business men can understand, and regard as a good reward for the working of borrowed capital.

Such excellent financial result from the first section was an inducement that the Commissioners could not resist; and so they determined, without much loss of time, to continue along the high road they had taken, and to leave completely behind them the old works. Thus it came to pass that the second section of Granton was taken in hand, in order to permit the absolute termination of gas manufacturing operations at Edinburgh. Appended to the report of the proceedings at the inauguration of this second section, and the description of the works, published last week, were several tables, from which judgment can be drawn as to the technical success—the base of the commercial success to which reference has been made—that Mr. Herring has obtained from the unique and mammoth combination of plant that he has installed at Granton. The tables are in part those that accompanied his Institution paper in 1905, with another year's working supplementing, and corroborating, in a peculiarly clear and (to a technician) fascinating manner, the anterior figures. It may be said that Mr. Herring has had opportunities such as do not fall to many men. True. It may also be said that it is from the effective combination of plant that opportunity allowed, and not from any one particular part of the whole, that he has, in his financial working results, done so well. True, again. But that when putting the results into comparison with other works, it must be remembered those other works are for the most part, as they stand to-day, the outcome of a process of long incremental construction; and therefore as effective manufacturing concerns, they can hardly be expected to vie with the complete monuments to modernity in gas-works operation that are now to be seen at Granton. It may all unreservedly be admitted. But in considering the figures, the difficulties encountered in the starting of new works must not be forgotten. All that Mr. Herring, we take it, has aspired to in publishing the annual statistics from Granton, and the analyses, has been to justify the scheme of his choice not only to his Commissioners, but to his technical friends, and to not over-fastidious critics.

There is one point connected with Granton over which there has been an abundance of both overt and covert criticism, and that is as to what has been described as the elaborate character of the design, and the weight of capital expenditure that is supposed to be a concomitant of elaboration. It depends upon what constitutes elaboration as to whether capital expenditure is unnecessarily heavy and wasteful. If blue brick bases, light brick pannelings, red brick pilasters, stone pediments, the provision of dormers, and such-like touches that give pleasing effect and artistic merit to a design, are called wasteful elaboration, then we do not agree; for such things do not cost much, if anything, more than severe, eye-torturing, and depressing stiffnesses—a character of design that strongly reminds one of juvenile architectural efforts with slate and pencil. The buildings at Granton look nice; and therefore it is erroneously thought they have cost a lot of money. That is not the case. Or if economy-producing devices that more than pay for themselves through the economy yielded, are called elaboration, then again we certainly do not agree. The first 10 million section of the works it was estimated by Mr. Herring in 1898, when the empowering Bill was before Parliament, would cost £45,000 per million cubic feet of production. Turning back to the evidence then given, it is seen that this estimate was confirmed by Sir George Livesey and Mr. Corbet Woodall. In the result, however, as will have been observed in the description published last week, the actual cost worked out to £42,000 per million—or £3000 below the estimate. Be it remembered that these were, as already said, new gas-works on a virgin site; and consequently much of the expenditure in dealing with the site was common to the first section and to the succeeding ones. Therefore taking into account the initial work common to the entire scheme, and the modern character of the equipment (with mechanical operation to an extent never before applied to a works of like magnitude, and everything of the most substantial character), so far as we are aware the cost of the first section compares well with anything else that has been done in the construction of large gas-works on a new site. There are other works that have been built on a new site that we believe have worked out slightly cheaper per million, but they have not been comparable in respect of the extent of mechanical operation to which so much of the Granton economy can be traced. The Leicester works, we seem to remember, ran out to rather less—perhaps a couple of thousands less—per million; but the remark as to dissimilarity and therefore incomparability in regard to mechanical arrangement applies in this case. But as we have said, a substantial proportion of the expenditure on the first section has reference to future sections, and will lighten the cost per unit of output accordingly as progress is made in construction. Something as to what this means is seen by the statement in the description that "there is every "reason to believe that the second section now approaching "completion, which it was estimated would cost £200,000, "will be likewise completed within the estimated expendi- "ture." Therefore on the evidence of past and present—without giving any special consideration to the variation of conditions of the labour and material markets, taking, too, into account that the Granton works were not to introduce an objectionable feature into the fair outskirts of Edinburgh—it cannot be said that Mr. Herring has expended extravagantly; but the best skilled testimony will be that the money has been spent both wisely and well.

It is upon statement No. 2, published last week, that the

searchlight of the highest of gas engineering intelligence will be turned, because it brings the analyses of the wages book at Granton up to date, in continuation of the Institution paper of last year. This statement as set out is what Mr. Herring has formulated as a suitable model for producing comparable working statistics. Everything appears to be given here that is fairly chargeable to manufacture; and much is brought out that is not disclosed by the basis adopted in "Field's Analysis." Unless someone has a better form to introduce, this one might well be adopted; for it will continue to be altogether impossible to make any fair comparison of the working costs of different works until a reasonable system of definition as to what should be chargeable replaces the chaotic lines of statement that at present exist. The tables call to mind several of the points that were raised in Mr. Herring's paper in 1905. In the lines Nos. 27 and 28, under "Other Items Chargeable to Manufacture," we have charges that, in many English undertakings, are suspected of being disposed of under the item of repairs and maintenance; but it seems only right that they should be charged up to manufacture, because a concern cannot be kept going without its maintenance as a manufactory as distinct from the maintenance of the plant itself. Looking at the statement generally, the corroboration of preceding history of low costs in all directions at Granton is almost monotonous. But taking the whole of the costs as given in the statement, last year excels previous ones in economy—the total labour costs in running the works, from rail inlet to main outlet, amounting to 1·998d. per 1000 cubic feet in the year ending May 15 last, as compared with 2·085d. in 1904-5, and 2·448d. in 1903-4. Taking 2d. as the figure for last year, it compares (the lines at the bottom of the statement show) with the English average for 1903, worked out from "Field's Analysis," of 3·03d.—that is, taking groups Nos. 1, 3, and part of 4 in the statement—and the average for the three London Companies for 1903 of 3·01d. Making comparison on English basis, the Granton figure would be 1·69d. We would suggest that Mr. Herring might have got a little nearer than the 1903 figures when making the comparison.

Still on statement No. 2, there is a point upon which we should like a little explanation. The cost of purification per 1000 cubic feet is running down to fine figures. In 1903-4, the cost per 1000 cubic feet was 0·240d.; in 1904-5, 0·182d.; and in 1905-6, 0·125d.—a reduction between the first and last figures of about one-half. The item of lime spreading and slaking has been diminishing, and perhaps revivification *in situ* has something to do with the reduction of the item of oxide charging, discharging, spreading, and turning. Perhaps Mr. Herring will enlighten us on the cause of the considerable reduction.

Another matter raised in the 1905 Institution paper had reference to the question of fuel consumption. Mr. Herring then pointed out the relationship that low estimates of coke production per ton had to low fuel consumptions, figures relating to which, as a matter of fact, are not sometimes worth the paper they are written upon. Many managers reckon they only produce 12 cwt. of coke per ton of coal carbonized; while 15 cwt., they would find, if they only took the trouble to weigh the coke, is nearer the mark. But note the difference that such an estimate and the actual figure would make in the fuel consumption. In statement No. 1 it will be observed that the weighed quantity of coke used in the retort-house at Granton last year was 12·45 lbs. per 100 lbs. of coal carbonized.

Having regard to the character of the Granton scheme, the tables are all highly interesting. Economical running costs were sought by Mr. Herring; and he has found them, as witness not only the three years' analyses, but the substantial results which are the attestations to success that appeal to the callous commercial mind, that sees no beauty in decimals and fractions, but delights in the bulky whole numbers that come as the due reward of judicious investment. And such an investment has been the money expended at Granton.

The Sulphur Restrictions—Another Joint Bill.

In our "Correspondence" columns, we publish a letter from Sir George Livesey, calling attention to the desirability of completing the good work effected in the current session of Parliament in the removal of sulphur restrictions. It is proposed to promote, in the ensuing session, a Repeal Bill to be joined in by all the Companies who still remain under these restrictions, and who for some reason or other abstained from action in this direction when the opportunity was afforded them last year. It is greatly to be hoped that none will miss the present opportunity of abolishing the last traces of a piece of legislation which has reflected but little credit on the wisdom and common sense of those who are answerable for it. Prejudice and ignorance are, it must be admitted, difficult to overcome; but it is on all accounts most desirable that the emancipation which was inaugurated by the London Gas Act, 1905, should now be completed by the liberation of all the remaining gas undertakings to whom these restrictions continue to be applicable.

As, however, may be gathered from Sir George Livesey's letter, there is a little reluctance in some quarters to taking the necessary steps for obtaining the freedom which is within their grasp. This reluctance is much to be regretted in so far as it may be prompted by fear of opposition on the part of Local Authorities; it is lamentable as proceeding from a want of appreciation of the advantages of freedom as applied to the administration of a gas undertaking. As regards the former, it may be pointed out that no opposition could be stronger or more determined than was that of the Corporation of Newcastle last year; and they had in their favour the somewhat unexpected, though temporary, results which followed the abolition of lime purification in the Metropolis. Even with this advantage, however, the opposition was a signal failure; and now that another year's experience has been gained, under normal conditions, what possible chance of success can any similar opposition have? Those who may be holding back through any fear of opposition need not therefore be disturbed on this score, we can thoroughly assure them.

It may be less easy to arouse the indifferent to action; but it may be pointed out that a grave responsibility rests upon those who wilfully disregard their opportunities. An opportunity now occurs to them to obtain a very important measure of freedom at but nominal cost; and it may never recur if now rejected. It is moreover in the general interests of the gas industry that all should stand shoulder to shoulder in such matters, and that, as far as may be possible, there should be uniformity of practice with regard to them. There cannot be two opinions as to the advantage to be derived from the abolition of compulsory lime purification, although this may vary in degree. Whatever its extent, however, it cannot but make for cheaper gas, and that is an object for which all must strive. Competition with electricity is likely to increase in severity as time goes on; and gas manufacturers can ill-afford to lose a single point in the game. They may be fully trusted to supply that which experience proves to be satisfactory to their customers, in which view it is highly desirable for all to receive whatever measure of freedom may be offered to them. It is indeed to be hoped that before long the bounds of freedom may be much more widely set; but indulgence in dreams of the future can form no excuse for spurning the liberty that lies immediately before us.

Wanted, Fresh Managers of Local Affairs in London.

The apathy of the ratepayers has been the curse of local government in London. It has put into a dominating and powerful position men who, neither by training nor native ability, are competent to manage the important interests with which they are entrusted; and the result is mirrored in the growth of the average rate poundage from 5s. 2d. in 1890 to 7s. 6d. in 1905. But the process of averaging shields the ruinous condition of affairs in certain East-end boroughs, in one of which, where extravagance has been allowed to run riot, the poundage has reached the unprecedented figure of 12s. But the average rate in the pound, significant as it is, does not show to the full the enormous increase there has been in the amount expended by the local authorities on local government. A couple of total figures will better exhibit the present position. The sum paid in rates in 1890 reached £7,564,100; while this year it is estimated at £15,000,000, or almost twice as much as it was sixteen years ago. All suffer—industry, commerce, and householders alike. The petulant ratepayer pays—and grumbles; and he then passes along with easy bearing, unmindful of what he and others might do to bring about greater economy and efficiency. It is the men who are put in power, and not the times, that are at fault; and this fact has been dinned into the ears of the ratepayers time after time, but without any great effect.

They also overlook the fact that the amount that appears on their private demand-notes does not comprehend the sum-total of what they pay in the way of rates. All the necessities of life are made the dearer by excessive expenditure on local government. When gas, for example, has to bear rates equalling 2d. or 3d. per 1000 cubic feet, the consumer of (say) 50,000 cubic feet of gas in a quarter can calculate that he has paid, in addition to the sum appearing on his own demand-note, fifty twopences or threepences (or whatever the figure may be) towards the rates. And so it goes on in connection with other commodities.

Where on the one hand real improvement is produced in a matter of local concern, on the other all the principles of political economy are rent asunder by the incompetents and the irresponsibles in the bringing into existence of some new fetish. Indeed, the squandering of public money has produced so little good that the proportions of the one to the other are absolutely absurd. When and how, we may ask, have the ratepayers of London been benefited by the great expenditure of money to give the municipalities possession of electricity undertakings, compared with the position they would have been in if the supply had been left to private concerns under statutory regulation? The ratepayers have had to pay heavily for deficiencies, and (through the general district rate) expenses that should properly have been borne directly by the electricity undertakings. And they have also had to pay dearly for extravagant public lighting—three, four, and even five times more than is paid for incandescent gas lighting per mile of thoroughfare; and all for the sake of the electricity undertaking. Wasted light can be seen near the housetops in many parts of London where municipal electricity holds sway. Who benefits? London is not a better London to-day in consequence; business is not greater as a consequence; nor do we find there are fewer accidents. Then where is the justification for it all? The wise legend inscribed on the banner of local government in days past, "Economy with Efficiency," has been besmirched; and now prices for incandescent gas lighting, showing savings without any impairing of efficiency, are shamelessly discarded in order to give extended patronage to the municipal electricity concern. It is pure waste without remorse, as witness Oxford Street.

Who are the men responsible for this state of things? In seventeen out of the 28 boroughs of London, Progressives, Independents, Labour men, and Socialists coalesce to form the majority; and in eleven only of the boroughs are the Moderates in the ascendancy. We hope it is not a mistaken view that there are signs of the ratepayers stiffening their backs against the vicious and dissolute rule of their local affairs, and untrammelled expenditure, by men who are totally unfit for administration on the large scale; and, in the interests of London, it is trusted that the ratepayers will, at the coming November elections, see to it that the dominating party returned is the one that will restore moderation and prudence into the government of Metropolitan affairs. The Progressives have prepared a rough outline of a scheme by which they propose the centralization and an extension of the government of the Metropolis. Their flights are always high. Experience of centralization, as exemplified by the County Council, has not proved itself to be altogether advantageous, nor has devolution as represented by the Borough Councils. Extension of the powers of the authorities and the apathy of the ratepayers have between them wrought much ill; and it is only by displacing the apathy by energy that change will be effected. It is one of the planks in the platform of the Municipal Reformers (which is the new title for the Moderates) that there should be no trading by the Borough Councils in electricity. That trading has worked sad havoc in local finance. There are few of the Borough Councils in which the Moderates are in the majority that have an electricity undertaking. But on the north side of the Thames, those Councils in which the Progressives outnumber the Moderates have, with but few exceptions, indulged largely in electricity supply, and to an extent that disturbs confidence. The rule is that the rates are heaviest where the Progressive element is the strongest, and where a large proportion of the local debt is due to municipal trading. These are facts that cannot be refuted; and they do not support the oft-advanced assumption that the possession of productive undertakings by municipalities tends to lighten the rates. If they did, then truly the rate poundage ought to be less where such undertakings have been than where they have not been established. Current statistics show the not uncommon feature of the sum expended in municipal trading in London boroughs to be equal to half or two-thirds of the local debt; and the greater part of these proportions is sunk in electricity undertakings, the plant of which the modern electrical engineer of the Merz type tells the world could now be replaced at far less than the outstanding debt upon them.

The Progressives are talking about the equalization of rates in the Metropolis, which is a phrase that includes the levelling down of the expenses of spendthrift boroughs by contributions drawn from others that are better managed. We can understand equalization in respect of the care of the aged and indigent, of education, of sanitary improvement—for therein is benefit for the community at large. But equalization ought not to be carried beyond this, so that one borough should be made to assist in bearing the burdens of the prodigality of another. Take Battersea for example. The Council have a local debt of £865,754; and of this no less than £700,635 is invested in municipal trading. The rates are 8s. 2d. in the pound! Take Poplar again with a local debt of £363,058, of which £248,518 is invested in municipal trading. The rates are 12s. in the pound. Why should boroughs that have been more provident assist those (excepting perhaps within the limits referred to above) who have speculated often, and speculated wildly?

It is earnestly hoped that all who are concerned in the welfare of London—in its people and industries—will do their utmost at the coming elections to divert the direction of local affairs from chaos and recklessness to order and prudence. A low rate is one of the fundamental elements in true communal progress; and a low rate is the product of wise administration.

The Ipswich Gas Company's Assessment Appeal.

In another part of the "JOURNAL" will be found the judgment of the Recorder of Ipswich (Mr. T. C. Blofeld) in the appeal by the Ipswich Gas Company against the assessment of their undertaking for rating purposes. The matter came before him at the end of July, and he reserved his judgment. It may be remembered that in the course of the proceedings it was stated by Mr. Horace Avory, K.C., who conducted the case for the Assessment Committee, that the dispute between the parties was really over the question of the amount of tenant's capital; and he submitted that the well-known Lee case did not now apply, inasmuch as the old order of things had been entirely changed by the introduction of prepayment meters. In view of the altered conditions, the learned Counsel said it would be necessary to have some judicial declaration as to what is now the right principle to go upon in rating gas undertakings. When noticing the matter on the hearing, we remarked that the Recorder had a very troublesome case to decide; and after giving his judgment he acknowledged that he had never had a more difficult one in his life. It will be seen that his decision is in the appellants' favour; but, unfortunately, it is marred by an "if." The learned Recorder founded it on the assumption that prepayment meters fixed on consumers' premises are, like stoves and fittings, "the property of the hypothetical tenant," and therefore to be "taken into account as part of the tenant's capital" in arriving at the gross and net rentals. He accordingly fixed the former at £13,000, and the latter at £5200, instead of the £17,681 and £6000 appealed against. This was in accordance with his reading of the Lee case. But now comes in the "if." He added that if the articles referred to ought not to be taken into account, the appeal would have to be dismissed. In view of the indefiniteness of the decision, it is not surprising that the Counsel for the Assessment Committee asked for a case to be stated in the event of their determining to take the question to a Higher Court; nor that the Recorder at once expressed his willingness to comply with the request. Consequently, we have probably not heard the last of the matter.

The London Junior Association.

We are glad to notice that the London and Southern District Junior Gas Association have commenced the present session in a manner that holds forth good promise for the future; and those members who have endeavoured to infuse into the Association that life which towards the close of last session it showed signs

of being in need of, are to be congratulated on the success of their efforts. A decided improvement last Friday was that the business was transacted in a very much larger and more comfortable room at the Regent Street Polytechnic than had been secured on previous occasions. The attendance, too, was much above recent numbers, even if it did not absolutely constitute a "record" for the Association, which we are inclined to think may have been the case. There were about thirty present; and members should make a special point of seeing that during the present session the average does not fall below this number. There ought to be no very great difficulty about this, in view of the present membership roll and the large district which the Association covers. Some new adherents have no doubt been secured this year; but perhaps there are still more who are eligible to join, and who would benefit by discussing with other of the junior members of the profession the many questions of interest in connection with the gas industry. If there be any such, the Hon. Secretary of the Association (Mr. J. G. Clark, of No. 69, Winchester Street, King's Cross, N.) would certainly be glad to hear from them. It should be pointed out that, in addition to the business meetings, visits to gas-works and other places are carried out by the Association, which are perhaps equally as instructive as the technical papers and discussions. From the report which appears in another column to-day, it will be seen that Friday's meeting was a full one—comprising, as it did, a short address by the President (Mr. W. Upton) and a paper, which was very carefully discussed, by the late President (Mr. Walter Grafton, F.C.S.).

A Good Start by the Manchester Juniors.

The members of the Manchester and District Junior Gas Association opened their session on Saturday at Tyldesley, and had an interesting and instructive meeting. They were first afforded an opportunity, by the courtesy of the Astley and Tyldesley Coal Company, of descending the St. George's Pit, and making a close acquaintance with the stores of raw material upon which depends the continuance of the prosperity of the country and of the industry in which they are engaged; and they were subsequently enabled to witness some of the effects of the extraction of that raw material upon the works by which it is converted into the commodity constituting the staple of their industry. For both of these privileges, the thanks of the members were heartily expressed in the customary manner. The new President—Mr. R. H. Ginman, the Gas Manager to the Tyldesley Urban District Council, was the host of the members; and he entertained them liberally. His address, as will be seen from the report which appears elsewhere, was devoted mainly to an account of the reconstruction of his works which has been going on since the spring of 1901, when, as he told the members, they were, to all intents and purposes, "a scrap heap, and in a very neglected condition." What he has made of them and of the gas undertaking generally will be found recorded in detail in his address. Starting in 1902 with an adverse balance of £1469, by April, 1904, he had reduced it to £328. One factor in connection with this achievement calls for special notice. Early in 1903, Mr. Ginman had his attention drawn to the question of hiring cookers; and the result of a close study of the subject was a recommendation to his Committee to abolish the hiring fee, and make a charge of 10s. towards the cost of fixing. This was done, but it left room for further improvement in view of the loss of consumption for street lighting and through the introduction of incandescent burners. Eventually, it was decided to allow a discount of 10d. per 1000 cubic feet on gas used for cooking, heating, and motive power (making the net price 2s. 11d.), using a discount meter with each cooker. The new system was started on July 1, 1905, and by the 30th of June this year they had 206 cookers fitted with these meters, and found the average consumption was 6600 cubic feet of gas. This Mr. Ginman thinks is hardly enough; but it will right itself in time. The point is that, as the discount meter enables him to check the consumption of each stove, he will be able, as fresh applications for cookers come in, to weed out those which are not now profitable; in other words, to give the discount to those only who will make the best use of it. Other points in the address—especially the suggestions of subjects for papers—are worthy of the careful attention of the members, who, we trust, will unite to make the session a thoroughly profitable one.

The Metric System in England.

At last it seems that, for better or for worse, the metric system is to have a practical trial on a really fair scale in this country. Last week it was announced that the large manufacturing firm of Kynoch and Co., Limited, of which Mr. Arthur Chamberlain is the head, had decided to adopt this method for their calculations. The proposal is that all the weights and measures shall be metric; while for monetary purposes the pound sterling will be adopted as the unit, and worked down to four places of decimals. The firm, of course, do a huge business with other countries; and Mr. Chamberlain is of opinion that the English conservatism in regard to weights and measures is seriously retarding our commerce abroad. Messrs. Kynoch, he adds, "have their ambassadors all over the world; and they know that it is all important to consult the convenience, and even the prejudices, of a prospective customer. Foreigners will not bother themselves over catalogues which are printed in a language they do not understand, and in figures based on a system of reckoning which follows no intelligible principle." Evidently therefore the Directors have been guided to some extent in their determination to adopt the system by considerations relating to their export trade; but in addition to this it is believed that the cost of calculations will thereby be enormously reduced. At the same time, Mr. Chamberlain admits that it will entail initial trouble and expense, as all their weights and measures will have to be re-standardized. As regards the trouble, however, he says that it will not represent a hundredth part of what they continually suffer under the old system; while compared with the size of the works and the magnitude of the transactions carried out, the expense will be quite unimportant, and in any event will repay itself in the first twelve months. The firm hope to have the new system in full operation by the end of the present year; and particulars are promised then, if desired, as to the cost of the change, its saving, its advantages, and, if any are found, its disadvantages. This information will certainly be eagerly looked forward to; for the experiment is one that will be keenly watched alike by friends and opponents of the metric system.

Reinforced Concrete for Gasholder Tanks.

In the course of Mr. F. D. Marshall's letter on "Coke and the Cement Trade" which appeared in a recent number of the "JOURNAL," he alluded incidentally to the growing use of reinforced concrete, and expressed astonishment that, in view of its extensive employment on the Continent, so little has been done with it in this country. Mr. Marshall recalled the fact that some time ago he had the privilege of reading a paper on the subject at the meeting of the first Institution of Gas Engineers, in which he pointed out the advantages of this method of construction, which was introduced by M. Monier, especially as applied to gas-works. It is ten years since Mr. Marshall brought the matter under the notice of his colleagues in the gas profession. At that time he was building entirely new gas-works to replace the existing ones at Fredricksberg (Copenhagen); and so impressed was he with the advantages of the system of construction in question, that he was employing it for the arches supporting the Manager's house, the offices, meter-making shop, station-meter room, engine, boiler, and condenser rooms, tar and ammonia tank, and the floor of the coal-stores. The tank was the largest of the kind constructed on the Monier system, and the first, as Mr. Marshall believed, to be built in a gas-works. A few years later—in 1900—Mr. A. Baker laid before the members of the Institution an account of an experiment with a concrete and expanded metal structure carried out by him at the Beckton Gas-Works under the instructions of Mr. G. C. Trewby; and in the "JOURNAL" for Dec. 9, 1902, Mr. A. Vye-Parminter described the Cottancin system of steel-cored brick and cement construction, which has been largely used in France for building circular and other reservoirs, and was first employed by the Paris Gas Company for gasholder tanks. In the last number of the "JOURNAL," we gave some particulars in regard to a reinforced concrete tank built for the Key City Gas Company, of Dubuque, Iowa; and we commend them to the attention of those of our readers who are desirous of acquainting themselves with the method of practically applying the system of construction which had so favourably impressed Mr. Marshall.

A Proposed Citizens' Industrial Alliance.

Yet another congress of labour is about to be held—that of the National Free Labour Association, whose delegates annually meet and discuss matters of more or less immediate interest to the men they represent. On the present occasion, in addition to resolutions of the customary character, a proposal is to be placed before the meeting in favour of a Citizens' Industrial Alliance, in order to combat the "now openly avowed true purpose of the collusion of Trade Unionism and Socialism"—the "capturing of the electoral and legislative machinery of the country for partisan and factional ends." Recent developments have, it is maintained, made manifest the absolute necessity for an organized and more comprehensive effort to meet the exigencies of the situation, if independent judgment on the part of public men, and the rights of individuals and communities, are not to be paralyzed and destroyed between the aims of the various factions; and it is suggested therefore that an Association should be promoted to adequately inform the public on the matter. In terms of the resolution to be moved at the forthcoming congress, the Association is intended to operate in the direction of a cordial alliance between all who are not in sympathy with the social and political purpose of Trade Union Socialism now openly proclaimed by that section of labour, so that concerted action may be taken by them. This action will be called into effective operation on all occasions of elections of representatives for Parliament, municipal corporate bodies, boards of guardians, &c. What the delegates to the conference may think of the proposal has yet to be seen; but on the face of it there does not seem to be any reason why organized effort should not be met by organized resistance. What with one thing and another, the Labour Party appear to be likely to be kept quite busy for a long time to come.

The Coal Conciliation Board.

It is gratifying to learn that the desirability of continuing the Coal Conciliation Board for the Federated Mining Districts in England and North Wales, after the expiry of the existing agreement on the subject at the end of the present year, was agreed to by both masters and men at a meeting which recently took place in Manchester. The gathering was in reality the resumption of proceedings which were adjourned after a meeting held in London during August, when the possible renewal of the agreement was first formally discussed. The points between the parties are naturally the terms upon which the new agreement shall be made, and the period during which it shall remain in operation. The question was not finally settled in Manchester; for after the proceedings (which were, as is the custom, private), the Joint Secretaries announced that when the parties had agreed as to the desirability of continuing the Board, and the views of each section as to the terms had been exchanged and discussed, an adjournment was made until later on in the present week, when the arguments will be resumed in London. It is stated that great cordiality between the parties existed at the conference; and this is, no doubt, a very hopeful sign. At the same time, however, it must be admitted that the differences to be arranged are of an important character. For instance, the men ask for an increase of the present minimum from 35 to 40 per cent. above the 1888 standard, the making of the minimum the basis of a new 1906 standard wage, and the signing of the agreement for the period of three years. The owners, on the other hand, while objecting to the increase of the minimum wage and to the fixing of a new standard, desire that the agreement should be for a longer period than three years. The real matter of difficulty, however, is the first point; and if this can be overcome, there is no reason whatever to suppose the Conciliation Board will not continue to exercise the good influence which it has hitherto done on the relations of owners and miners in the district which it covers. The question that has been mooted, of one minimum to apply to every mining district of the country, is outside the scope of the present discussion; but it is believed that this, with one National Conciliation Board, is what the Miners' Federation would like to bring about. At present, of course, there is a different minimum in each of the Federation areas of England, Scotland, and South Wales.

Yorkshire Junior Gas Association.—The fourth annual general meeting of the Association will be held next Saturday, at the University, Leeds. After the business meeting, Mr. Thomas Newbigging will deliver an address.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 268.)

THE Stock Exchange opened last week in a very uncertain mood; and movements in markets were irregular, though for the most part downward. Apprehension regarding the next turn in the monetary position was, of course, the dominant factor, though the signs and portents were variously interpreted. On Tuesday, rather brighter views prevailed; and some buyers came in to clinch the low prices. But this phase gave way in its turn; and, with the prospect of high contango rates, commitments ahead to any considerable extent were closed down. When on Friday a bolt from the blue in the shape of a 6 per cent. Bank rate fell, business received a violent shock at first. But calmness soon asserted itself; and though prices were naturally lower, there was nothing sharp or panicky in the movement. Thenceforward, until the close, things were very quiet; there being little disposition to rush into selling, while would-be buyers thought there would be no harm in waiting a little longer. In the Money Market, the very rare occurrence of a change in the rate on Friday—a few hours, so to speak, after it had been decided not to change it—was the surprise of the week. It is nearly seven years ago since the high figure of 6 per cent. was decreed. Business in the Gas Market was very quiet taken all round the list of issues; but the dulness was relieved by the brilliant activity of one of the remoter undertakings which has scope for developments. With this exception, the tendency was decidedly downward; for not even gas companies' stocks can be expected to be wholly insensible to revolutions in the Money Market. In Gaslight and Coke issues, the ordinary was very moderately dealt in, at figures which gradually and steadily shrank, just as prices elsewhere did. The best price realized was 99 on Monday; 98 was touched on Wednesday; and 97 on Saturday—a total fall of 1½ in the quotation. The secured issues were inactive. Dealings in the maximum were at from 89 to 90; in the preference, at from 107 to 108½—a fall of 1; and the debenture was not noticed. South Metropolitan, after being quiet, came into action and participated in the weakness; transactions ranging from 133¼ on Wednesday to 131½ on Saturday—a fall of 2 in the quotation. The debenture marked 85½ and 86. Commercials were hardly touched. The 4 per cent. was done at 114, but the quotation was afterwards put down a point; and the debenture changed hands at 85¾. The Suburban and Provincial group were quiet as usual, but kept well up. Bournemouth "B" marked 17⅛, Brentford old 261, ditto new 200, ditto preference 121, British 41½, Tottenham "A" 128 and 129½, and West Ham debenture 103 and 103½. Maidstone improved 2, Bromley "A" 1, and Newcastle 1. The Continental Companies were but moderately dealt in. Imperial changed hands at from 188 to 186½, European fully-paid at from 24¼ to 24⅜, and Union at from 124 to 123—a fall of 1. Tuscan was done at 10$\frac{31}{32}$ and 11, and ditto debenture at 105. Among the undertakings of the remoter world, Primitiva had the most attention in view of great expectations. The ordinary marked from 7⅜ to 8$\frac{1}{16}$, and the preference from 5⅛ to 5$\frac{5}{16}$. River Plate was done at 12½ and 12⅝, San Paulo at 13⅞, Monte Video at 11⅞, and Bombay at 7$\frac{1}{16}$.

The closing prices are shown in our Stock and Share List on page 268.

ELECTRIC LIGHTING MEMORANDA.

High-Efficiency Incandescent Lamps and the Future—The Best Light for the "Great Majority" of Streets—The Flame Arc in America—The Renewal of Electric Incandescents—The Price of Power—A Strange Coincidence—The "Electrical Times" and Mr. Goodenough's Recent Lecture.

THE new high-efficiency electric lamps of the Nernst and tantalum classes, and those of the tungsten and other types that the laboratory promises to give birth to, to aid the ordinary carbon filament lamp in its competition with the incandescent gas mantle, are being looked at somewhat askance in unprogressive electrical circles; and in other directions the faith in them does not increase with time. There was at first a great banging of the big drum over them; but then the more sober-minded among electricians advised a little less noise until something more tangible than laboratory promises was forthcoming, and until the new position that any such successful lamps would create was well examined. Most of the lamps are not suitable to the conditions of electricity supply in this country, and they are so sensitive that they will require very precise care and regularity in condition of use. These are points well known to, but little advertised by, electricians. But although the present lamps suffer from somewhat delicate constitutions and fastidious tastes, there is some timidity among certain electricians regarding the effect, if a really decent lamp of the class should come along, that it would have upon the sale of electricity; for most electricity undertakings can ill-afford to shorten output and receipts. If a really good high-efficiency lamp is developed, it ought to be heartily welcomed; for as things have been for the last two or three years in the domestic lighting field, electricity undertakings have not been making much headway there. What is badly wanted by them is a more economical and reliable lamp. The reduced consumption

of gas per point of illumination produced by the incandescent gas mantle, and yet the extension of the gas business simultaneously, ought to be encouraging to electricians as they meditate over the possible effect of the coming of a perfect high-efficiency incandescent electric lamp. But the electricians complain, *sotto voce*, that they have not the economical cooking and heating stoves that the gas industry possesses to render them assistance. They have certain articles that they designate electric cookers; but there are electricians of our acquaintance within whose households they have not found entrance, but gas-stoves are there in daily use. Those electricians guard their purses, and prefer reliability to the introduction of uncertainty, and consequently further trouble, into their kitchens. But reverting to the higher efficiency lamps, even if a dependable one and one applicable to British conditions should eventuate, the "Electrician" holds out the consolation to electricity suppliers that human inertia will prevent anything in the way of rapid change; and that as clusters of low candle power lamps look more effective than single higher candle power ones, the æsthetic tastes of the British householder will cause his preference to remain firm with the carbon filament lamp, with all its faults and wastefulness.

Our electrical contemporary is of opinion that the competitive value of the high-efficiency lamp will be more apparent in street lighting than in any other line; and remarks are made editorially in this connection that are worth quoting:

> At present the flame arc lamp can hold its own against the various forms of gas lighting; but the great majority of thoroughfares are not sufficiently important to warrant the cost of arc lighting, and are sufficiently illuminated by low-pressure gas and incandescent mantles. These produce a fair illumination; the light being given at points which are closer together than would be possible, commercially, with arc lamps, and consequently with a less "spotty" effect. The ordinary glow lamp has been found to be too costly, from the energy point of view, for this kind of work; but if a really high efficiency metallic filament lamp—running at 1 to 1½ watts per candle—were put upon the market, there is no reason why the lighting of such thoroughfares should not be effected electrically as cheaply as with gas, and without the disadvantage of the frequent renewals which are necessary with the mantle.

We shall, of course, see. But it is satisfactory to know from such an authority as the "Electrician" that the *great majority* of thoroughfares are not sufficiently important to warrant the cost of arc lighting, and are sufficiently illuminated by low-pressure gas and incandescent mantles. There is also the admission, printed large, that the electric industry has not at the present time, anything in the way of lighting that can be economically used in the "great majority" of streets. "*If* a really high efficiency metallic filament lamp were put upon the market"—— But, there, that is a matter the discussion of which will keep, as it appertains to the unknown future. No doubt plenty of opportunity will be found for dealing with it later on.

Something is said above about flame arc lamps—the trembling idols of the electricity industry. We have been reading a paper on the subject by Messrs. Marks and Clifford presented to the American National Electric Light Association. The authors say many things that have been said before outside Atlantic City; but it is interesting to get world-wide testimony as to the shifty characteristics of the flame arc lamp. We read that the gain in efficiency by these lamps has been obtained at the expense of the life of the electrodes. Owing to the rapidity with which the carbons are consumed, it has been found necessary to shield the tips as far as possible from "washing" of the air currents in the globe. This is not explicitly expressed; but the meaning is gathered. Among other gems we find these: The vapour resulting from the burning of the mineralized carbons condenses for the most part on the economizer and contiguous portions of the lamp casing. The arc is extremely sensitive to currents of air in the globe, and to variations in the magnetic field, as well as to movements of the regulating mechanism of the lamp. In the very nature of things, the tendency of a long arc operated in the manner employed in flame arc lamps is towards unsteadiness. The variability of air currents in the globe, the lack of uniformity in the chemical constituency of the mineralized carbons, and the action of the magnetic field (where such is employed)—these and other difficulties all conspire to produce unsteadiness in the light.

Passing from unsteadiness to the limitations of the lamp in utility, there was not much said by the authors that was favourable. For interior illumination where colour values are at all important, the yellow light flame carbon lamp is objectionable. Under the light, white material appears cream coloured; the shades of yellow are intensified; and the colour values at the violet end of the spectrum are naturally distorted. [The managers of drapery establishments should note this.] It is quite impossible to distinguish different shades of dark blue from one another—all of them appearing black. With the white flame carbons, however, most of the colours have, it is said, approximately their correct daylight value. With regard to the utility of the flame arc for street lighting, most of the light of the lamp is thrown downward in a zone from 30° to 90° below the horizontal; the amount of illumination dropping off quickly towards the horizontal. The maximum illumination is at about 45° below the horizontal; but the lamp sends its rays with almost equal brilliancy through all the angles from 30° to 75° below the horizontal. The conclusion of the authors is that, with the present distribution of illumination, the flame arc lamp (if it is mounted on a column having the same height as the standands now in use for street lighting) would produce an illumination in the immediate neighbourhood entirely out of proportion to that given at a distance of 125 feet to 250 feet, which is about one-half the distance that now obtains between the columns in arc lighting practice in America. To meet this difficulty, it is apparent that, unless the size of the unit can be materially decreased, the flame arc lamp must be placed very high above the ground—so high, in fact, that in most cases serious questions arise as to the practicability of such a procedure. Flame arcs do not look like making much progress in America, where they liken the illumination obtained to that realized by turning a strong headlight face downwards.

The renewal of electric incandescent lamps is a subject to which insufficient attention is paid by householders in making preliminary estimates on the insufficient data afforded them as to what lighting by electricity will probably cost. It is a matter to which we have called attention more than once; and it comes before us again in a communication that the Edison and Swan Company have made to an electrical contemporary concerning the periods of renewal. The Ediswan lamps are regarded as good ones; but even so, the table that the Company have prepared as to when changes should be made, if the consumer does not wish to waste his current, indicates the necessity of renewal on an average per point of lighting between two and three times a year. Lamps at 1s. 2d. to 1s. 3d. each, multiplied by the number of renewals per point per annum, and multiplied again by the number of points of lighting in a house, must cause a not insignificant addition to the lighting bill. Here is the prescription for renewals as prepared by the Ediswan Company: Lamps installed in January, should be changed in June; installed in February, changed in August; installed in March, changed in September; installed in April, changed in October; installed in May, changed in November; installed in June, changed in November; installed in July, changed in December; installed in August, changed in December; installed in September, changed in January; installed in November, changed in February; installed in December, changed in April. No doubt householders who follow this renewal scheme will get a better efficiency from the current that they have to pay dearly enough for under the best of circumstances; but they will not overlook the item of maintenance as a charge against the system of lighting by electricity.

The contention that power supply by ordinary electricity undertakings at 1d. and below per unit does not pay, has frequently been met with a sneer, though to the common-sense man it is perfectly obvious that it is true. If it were not for the lighting business at higher prices, the power business could not possibly be carried on; and therefore the power user must benefit at the expense of the lighting consumer. It is only logical to argue that, if the power business pays at 1d. per unit, then the lighting consumers ought to receive their current at prices greatly reduced from present charges. There is confirmation of the contention in the Presidential Address of Mr. W. B. Esson, M.Inst.C.E., M.Inst.E.E., to the Civil and Mechanical Engineers. He says: "Several of the London undertakings supply power at ¾d. per electrical horse-power-hour. The total cost of production, excluding capital charges, amounts to something over 1d.; and only because a large portion of the output is sold at a comparatively high price for lighting, can the power portion be supplied at a price which carries no administration or capital charges. Dumping units to fill in the valleys in load curves is a good thing; but when, owing to the loads overlapping, the generators must be set aside to supply power or lighting, but not both, obviously lighting pays better."

In the "JOURNAL" for March 13 (p. 711), an account was published of the narrow escape of the family of Mr. David Reed, at Green Street, Upton Park, from poisoning by fumes arising from the fusing of underground electric cables; and on that occasion the Electrical Engineer of the West Ham Corporation tried to traduce the local gas supply by imputing the blame to it. The article in these columns left no doubt as to the hollowness of the Electrical Engineer's assertions, and clearly demonstrated that his own department's distribution system was in fault. It is singular that Mrs. Reed, one of the unfortunate persons in that occurrence, was, one evening just recently, standing outside the same premises when she was suddenly overcome by poisonous fumes arising from the interstices in the pavement, and so serious was her condition that medical aid had to be summoned. The cause of the fumes was again the fusing of electric cables; but we have not seen that the Electrical Engineer has had the audacity to assert that the gas supply was to blame in this instance. We do not find any report of these occurrences in the "West Ham Electrical Bulletin," although report is made in its columns, in vivid detail, of a fatal accident to a woman, who, while dressing for her wedding, is supposed to have caught her hair alight at a small gas-stove. The terrible effects of the use of gas upon pianos are also told. We live and learn. Every day nearly Science is telling us where deadly microbes lurk—the latest place being in the milkman's whiskers. Every day the electricians seem to be finding out some fresh evil that their more than a century old competitor does. Marvellous is it not that a note can be got from pianos that have been in some families for—what shall we say?—a generation or more, in gas-lighted rooms! Of a truth, electricity users ought to live for ever, and their earthly possessions ought surely to be imperishable. This is an age of humour as well as of wisdom.

"Meteor" in the "Electrical Times" has been trying to minimise the effect of Mr. Goodenough's recent visit to the United Wards Club in the City by a few carping, and not very fair, comments on the report of the proceedings on the occasion in question. Mr. Goodenough, it is remarked, "does not believe in the adage that 'good wine needs no bush.'" We would like to know how many successful commercial men do! If "Meteor" holds that belief as strongly as he would lead his readers to think, what, we wonder, has he to say to the "Electrical Bulletin." He then proceeds to quote the opinions of three of the members who took part in the discussion that followed Mr. Goodenough's lecture, carefully omitting the remarks of those who mentioned such trifling facts as that the installation of electric light in one case had caused the cost of lighting to go up from £20 to £80 a year, and not mentioning the vital fact that the members he did quote admitted that they were comparing the cost of electricity with that of flat-flame gas-burners. Mr. Goodenough, and those who were present with him, can well afford to make "Meteor" and his readers a present of all the consolation they can get from his version of the discussion, the actual trend of which might have caused "Meteor" serious pain if he had been present. As to the danger question, what Mr. Goodenough characterized as a ridiculous absurdity was the action of the electrical industry in making such a to-do about accidents due to the misuse of gas, while ignoring the many accidents due to electricity—accidents which in so many cases destroy all the evidence of their cause. As he said, the line taken in the "Electrical Bulletin" is just about as sensible as if the makers of motor cars published a magazine largely taken up with accounts of railway accidents, with no mention of motor smashes. All the evidence points to the steady advance of gas lighting in public favour of late years having got seriously on the nerves of our electrical friends, and while the plan of thinking and saying that what is is not, may be cheering to those who can adopt it in good faith, it will not carry them a long way towards changing the one into the other.

PERSONAL.

Mr. EDMUND LORD has been appointed Chairman of the Rossendale Union Gas Company, in place of the late Mr. George Shepherd; and Mr. H. W. ASHWORTH is the Vice-Chairman.

It may be in the recollection of some of our readers that about five years ago Mr. George W. ANDERSON relinquished the position of Manager and Secretary of the Caterham and District Gas Company to take an appointment as Engineer of the Primitiva Gas and Electric Light Company of Buenos Ayres. This he has now given up, and returned to England; and on the 1st prox. he will join his brother, Mr. R. Bruce Anderson, in partnership.

OBITUARY.

The death is announced, at the early age of 49 years, of Mr. GEORGE WOODIWISS, J.P., who was Mayor of Bath in 1897, when the Incorporated Gas Institute visited the city during the presidency of Mr. C. Stafford Ellery. Those who were present at the meeting will remember Mr. Woodiwiss's kind welcome, and also the enjoyable reception and dance to which he invited the members. In many other directions also his hospitality was shown; and upon the completion of his Mayoralty, the citizens, as some recognition of his princely conduct, presented him with a silver candelabra, while Mrs. Woodiwiss was given a diamond pendant.

The Gas Committee of the Halifax Corporation have just lost a valued servant in the person of Mr. JOHN HOGGARD, who for eighteen years had filled the position of Superintendent of the works. He was seized with paralysis on his way to business on the 10th inst., and died on Monday evening last week—his case having been pronounced hopeless from the first. Mr. Hoggard commenced his career in the Scarborough Gas-Works. From there he went to the Darlington Corporation Gas-Works, and was eleven years foreman. He then took the position of general foreman in the Batley Corporation Gas-Works, and held it for four years under Mr. T. Holgate, the Engineer. When the latter moved to Halifax, Mr. Hoggard went to be Superintendent under him. He leaves a widow, three sons, and two daughters. His eldest son is Mr. J. T. Hoggard, the Manager of the Newton-le-Willows Gas-Works.

The Young and Glover Vertical Retort Patent.—We learn that, after a very searching examination, the specification of Messrs. Young and Glover for vertical retorts has been accepted by the Patent Office exactly as they submitted it. Objections, based upon several previous patents, were raised; but they were all removed on Messrs. Young and Glover explaining the entire difference in principle of their retort system.

The Kitson Light at the Milan Exhibition.—Those of our readers who have visited the Milan Exhibition may remember that the Kitson Light was installed for the illumination of one of the central parks in front of the German building, and was under the control of the Kitson Company of Italy. Information has just reached the Kitson Light Foreign Supply Company that the light has received the gold medal and highest award.

GAS ACTS FOR 1906.

THIRD NOTICE.

WE finish to-day the review of the Acts investing Statutory Gas Companies with additional powers. The Acts of Local Authorities will be dealt with in our next article.

In the North Sussex Gas Company's Act is scheduled a piece of land upon which gas-manufacturing works have been erected. This land is more convenient for the purpose than the site scheduled in the Company's Act of 1905; and therefore the Company had to seek parliamentary authorization to its use. This they have now obtained; but there is a proviso attached to the effect that upon the scheduled land the Company are not to manufacture any residual products. The capital powers obtained by the Company in 1905 have been doubled, and the borrowing powers increased. The Company have also water powers conferred upon them by the Act; and their title will, as the result, henceforth be the North Sussex Gas and Water Company. The water portion of the Bill will be noticed in a later issue. [*Parliamentary Agents: Messrs. Baker and Co.*]

By their Act, the Peterborough Gas Company have secured new land powers for works purposes, the parts scheduled adjoining their existing works. The usual powers are conferred for the utilization of the land. Sanction is also given to the purchase of additional land, up to 5 acres, by agreement. The capital of the Company is consolidated and converted on a 7 per cent. basis. Each holder of ordinary shares entitled to a dividend of 10 per cent. per annum is to receive £14 5s. 9d. consolidated stock; and each holder of new ordinary or new "A" shares is to receive £10 of consolidated stock. Additional capital to the amount of £80,000 is authorized. Including a sum of £17,625 already borrowed, the Company may borrow up to one-third of the nominal amount into which the ordinary capital has been converted, and up to one-third of the additional capital. Renewal, insurance, and reserve funds are provided for. As mentioned above, the standard dividend is 7 per cent.; and the standard price of gas is 3s.; but, in connection with the sliding-scale, there is to be a neutral zone between 2s. 10d. and 3s. 2d. Above the latter price, reductions of dividend will be at the rate of 1s. 9d. per cent. for penny increases in price, and below the former the dividend will advance by 1s. 9d. per cent. for penny reductions. The prepayment clause—allowing 10d. excess charge, 1s. including a cooker, and 10 per cent. on cost for meter alone—appears among a number of miscellaneous provisions of ordinary character. The illuminating power of the gas is to be 14 candles; and in its testing the table photometer, Harcourt's 10-candle pentane lamp, and Carpenter's Metropolitan argand burner No. 2 are to be used. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The capital of the Rochester, Chatham, and Gillingham Gas Company (the altered name) will, from the beginning of next year, and under the authority of their new Act, be consolidated and converted into a uniform 5 per cent. capital. The re-arrangement will be precisely as described in the notice of the Bill on Jan. 16. Power is accorded in respect of the raising of £150,000 of additional capital. On the consolidated capital created by the Act, the Company may borrow up to £20,000; and up to one-third of the issued additional capital. The standard price of gas has fallen since the introduction of the Bill from 3s. to 2s. 11d. For increases of price above 2s. 11d., the dividend will be reduced, in respect of any half year, by 1s. 3d. per cent. per penny advance. But the proprietors are only to benefit by reductions below 2s. 9d. The modern form of prepayment charge clause appears in the Act. Quite a batch of clauses have been inserted that did not have a place in the original Bill. There is one as to the pressure of gas; the illuminating power is now prescribed at 14 candles; and the new testing conditions have been adopted—including the table photometer. A testing place is to be provided at the Company's office in High Street, Rochester; and if at any time the three Corporations, or any one or two of them, shall require a testing place elsewhere, the Company are to provide and maintain it at the expense of the Corporations or Corporation—the situation, being not less than 1000 yards from the Company's works, to be agreed or settled by arbitration. A novelty in the way of a power gas clause is the following:—

> The Company shall, upon being required to do so by any person who would be able to require the Company to give a supply of gas under the provisions of the Gas-Works Clauses Act, 1871, give such person a supply of gas for use upon his premises for power; and the charge for gas so supplied by the Company shall not be less than 2d. per 1000 cubic feet below the price for the time being charged by the Company for gas supplied to ordinary consumers for lighting. The Company shall not be bound to afford a supply of gas under this section unless the gas so supplied shall be measured through a meter on the premises of the consumer separate from the meter (if any) through which such consumer receives a supply of gas for lighting; and the gas so supplied shall not be used by the consumer for any purpose other than as power. If any consumer shall use for lighting purposes the gas supplied to him under this section, the Company shall be entitled to recover from such consumer the amount which would have been payable by him to the Company if the gas so supplied had been supplied to him for lighting.

Power to purchase land by agreement up to 10 acres is granted; and insurance, renewal, and reserve funds provided for. [*Parliamentary Agents: Messrs. Dyson and Co.*]

By their Act, the Southampton Gas Company secure the additional powers they require in connection with the new works that it is expedient they should now provide to meet the growth of demand. The additional capital sought for and allowed is £350,000, with one-third borrowing powers. The dividends are limited to 5 per cent. on the additional ordinary capital, and to 4 per cent. on the preference capital. On scheduled land, now in the possession of the Company, they are authorized to build new works. A series of provisions have been inserted for the protection of the Corporation in connection with the breaking up of streets by the Company; among them being the extension of the notice required under section 8 of the Gas-Works Clauses Act, 1847, from three to seven days. The Company are now excluded from forfeiture by reason of the presence in the gas supplied by them of sulphur compounds other than sulphuretted hydrogen. Powers to purchase land by agreement up to 10 acres are granted. [*Parliamentary Agents: Messrs. Bircham and Co.*]

The South Suburban Gas Act is the last of a unique series of promotions that the Company have perseveringly indulged in, to complete the work that they set their hands to at the commencement of the series. What they could not get in the one piece, they obtained by instalments. But the new Act is nothing like the Bill as introduced, though the Company gained by it all that they could desire. The neutral zone of standard price has disappeared; and 2s. 9d. is now the standard—the variations of dividend being by 1s. 8d. per cent. for penny changes in price. The illuminating power of the gas is to be 14 candles; but notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act relating to the Company, if the illuminating power of the gas falls below 14 candles to an extent not exceeding ½ candle, the Company are not to be liable to any penalty in respect of such deficiency, but if the illuminating power is below the prescribed number of candles to an extent exceeding ½ candle, but not exceeding 1 candle, the penalty to which the Company are to be liable in respect of such deficiency is not to exceed £5. The Metropolitan argand burner No. 2, Harcourt's 10-candle pentane lamp, and the open-bar photometer are prescribed for testing. [Information on these matters was given by Sir George Livesey in our "Correspondence" columns on May 29.] The Local Authorities, it is also enacted, may provide a testing-place in each of their districts, which testing-place shall be deemed to be prescribed for the purpose of the Gas-Works Clauses Act, 1871, provided that no such testing-place shall be situated at a greater distance than 2 miles from the works of the Company, or elsewhere than on a leading main. Gas examiners may also test (but the Company are not to be liable to forfeiture in respect thereto) for calorific power, purity as regards sulphur in forms other than sulphuretted hydrogen, illuminating power as ascertained by means of a flat-flame burner (which is to be the best available pattern, and is to be used so as to obtain from the gas the greatest amount of light), and illuminating power as ascertained by means of a burner fitted with an incandescent mantle—such burner and mantle to be of the best available pattern, and to be so used as to obtain from the gas the greatest amount of light. For these tests apparatus and materials are to be provided by the Local Authority appointing the Examiner; and copies of the reports on the tests are to be regularly delivered to the Company. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Tottenham and Edmonton Gas Act is an important one for the Company, empowering, as it does, the purchase of additional lands, and their utilization to the specified extent for manufacturing works. A viaduct or overhead way and a subway under the Great Eastern Railway line are among the subsidiary works authorized, together with the covering in or culverting of a portion of Pymme's Brook. Protection is given to the Great Eastern Railway in connection with the former works and to the Metropolitan Water Board in respect of the work affecting the brook named. In regard to the same works, the Middlesex County Council and the Edmonton District Council have both secured protecting provisions. In addition to the lands described in the deposited plans and the book of reference, the Company may purchase by agreement up to 20 acres of land. As to money powers, they may raise additional capital of £600,000, with borrowing powers to one-third the amount. A renewal fund is authorized. The Company are now allowed to supply power gas; and there have been inserted the now customary conditions attaching to the supply of special gas for power use. The authorization to supply is subject to any regulations the Home Secretary may make in regard to the distribution of power gas, and to any general legislation there may hereafter be passed on the subject. The illuminating power of the ordinary gas is to be 14 candles; and in the testing of it the open-bar photometer is to be used, with Harcourt's 10-candle pentane lamp and the Metropolitan argand burner No. 2. In regard to purity, it is merely now enacted that "gas supplied by the Company shall be wholly free from sulphuretted hydrogen and shall not contain more than 4 grains of ammonia in any 100 cubic feet." They are, of course, relieved from penalty in respect of the presence of sulphur compounds other than sulphuretted hydrogen. The interest on money deposited as security for gas-meters is to be 4 per cent., instead of 5 per cent. [*Parliamentary Agents: Messrs. Dyson and Co.*]

From Jan. 1 of next year, the Uxbridge and Hillingdon Gas Consumers' Company will be known as the Uxbridge Gas Company, under the authorization contained in their new Act. The limits of supply are extended; and in connection therewith a protecting clause appears in favour of the Slough Gas and Coke Company and the Eton Rural District Council. Before supplying gas in the parishes of Stanwell, Horton, and Langley Marish, the Uxbridge Company are to purchase the West Suburban Gas Company for a price to be agreed upon, or, failing agreement, at a price to be settled by arbitration. The Company are empowered to put down manufacturing works on lands described in the first part of the schedule, and upon any part not exceeding 3 acres in extent of lands described in the second part of the schedule; and they are also given power to purchase up to 6 acres of land by agreement. The existing capital is to be consolidated and converted on a 5 per cent. basis. The additional capital powers are as in the original Bill—£75,000; but the Company are not to issue preference shares or stock to a greater amount than £45,000. Borrowing powers are allowed to the now usual extent. New issues of capital may first of all be offered to the gas consumers and employees. Insurance and reserve funds are authorized. The initial price of gas has been reduced from 4s. 6d. to 4s. 3d.; and the variations of dividend are to be, in respect of any half year, 1s. 3d. per cent. for penny changes in price. The illuminating power of the gas is to be 13 candles, tested by the Metropolitan argand burner No. 2, with the table photometer and Harcourt's 10-candle pentane lamp. If at any time after the expiration of seven years from the passing of the Act, the Company are not furnishing or prepared to furnish on demand a supply of gas in accordance with the provisions of the Act in any parish in that part of the Eton rural district in the county of Buckingham which is within the limits of the supply of the Company (and not supplied by the Slough Gas and Coke Company) or in the parish of Stanwell, any other Company may apply for an Act of Parliament or a Provisional Order to authorize them to supply gas in any such parish, as if there were no Company authorized to supply gas therein. The Middlesex County Council are given protection in respect of road work; likewise the Great Western and Metropolitan Railway Companies. [*Parliamentary Agent: Mr. R. A. Read.*]

The Watford Gas Company's Act empowers the conversion and consolidation of their capital in the following manner: £14,800 of "A" stock into £29,600 of "A" consolidated stock, and £15,200 of "B" stock and £30,935 of "C" stock into £92,270 of "B" consolidated stock. The standard rates of dividend are to be 5 per cent. on the consolidated "A" stock; on the "B" consolidated stock, 3½ per cent.; and on so much of the additional capital as is raised as preference stock, 5 per cent. The additional capital is to be £180,000 of "B" consolidated stock, to rank *pari passu* with the "B" consolidated stock, and to carry one-third borrowing powers. Since the Bill was introduced, the standard price has been reduced from 4s. 3d. to 4s. 1d.; and the sliding-scale will work half-yearly, by 1s. 3d. per cent. increments or reductions in dividend as the case may be in respect of penny changes in price. Lands are scheduled on which new works may be constructed and maintained; and power is given to purchase land by agreement up to 10 acres. Clauses are inserted for the protection of the Hertfordshire County Council in respect of road works. The illuminating power of the gas is to be 13 candles; and needless to say the Metropolitan argand burner No. 2 and Harcourt's 10-candle pentane lamp, with the bar photometer, are prescribed for the testing. The clauses proposing extension of the limits of supply, and the purchase by agreement of, or amalgamation with, the undertakings of the Chesham and Amersham Gas Companies, have been expunged from the Act. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

Phosphine Poisoning Caused by Ferro-Silicon.

In the current number of "Acetylene," attention is called to a paper read last summer before one of the German learned societies by Dr. Bahr (a physician) and Dr. Lehnkering (a chemist), describing two fatal cases of phosphine poisoning which occurred in March on board a vessel navigating the Rhine, and carrying a cargo of electrically manufactured ferro-silicon from Mannheim to Duisburg. The matter was considered to be worth careful study, because phosphine is a constant impurity in crude acetylene, and has sometimes been present in so large a quantity as to call for the imposition of a new rule governing the purity of merchantable calcium carbide. Full particulars of the occurrence are given; and it is stated that Dr. Bahr, who performed an autopsy on one of the victims, could not establish a definite cause of death. The general appearance of both bodies was that of carbon monoxide poisoning, except that the tissues and blood were not cherry red, and all the blood was fluid. Dr. Lehnkering chemically examined the organs, but no positive result could be obtained. He thought, however, there could be no doubt that the cause of death was phosphine poisoning. An examination of the vessel showed a defective cabin floor, through which so much phosphine was being evolved from the ferro-silicon in the hold that its characteristic odour could be at once perceived. On analysis, the material was found to contain 57·69 per cent. of silicon and 0·16 per cent. of phosphorus; while 0·25 per cent. by volume of gaseous phosphine in air is poisonous to man.

Alderman William Leach Lewis, J.P., one of the Directors of the Isle of Thanet Gas Company, left £65,186. The late Mr. Claud Baggallay, K.C., left £47,672.

MUNICIPAL INCOME AND EXPENDITURE.

Statistics from the Annual Local Taxation Returns.

Some further arguments for the use of contending parties in the discussion on municipal expenditure will doubtless be derived from Part V. of the Annual Local Taxation Returns, which was issued last week as a Blue-Book; but the value of the statistics suffers from the fact that they are brought down to a no later date than the year 1903-4—which, in the latter months of 1906, seems to be rather a long time ago. However, though belated, there is no cause to complain of the quantity of matter contained in the book, which consists of about 400 pages of tables, and deals with the accounts of the councils of boroughs (other than Metropolitan boroughs) and of urban district councils.

At the end of the period to which the Blue-Book refers, the number of boroughs in existence—excluding the Metropolis—was 323; and of these 69 were county boroughs. These are considered first of all with regard to their work as municipal authorities; and under this head the receipts (excluding loans, &c.), were £15,641,930, of which £5,770,928 was on account of elementary education. The expenditure not defrayed out of loans, &c., came to £15,245,335, including £5,755,185 in respect of elementary education. The items embraced in this expenditure include tramways and light railways, police, public libraries, museums, &c., administration of justice, lunatic asylums, establishment charges, salaries and superannuation of officers, &c. The receipts from tramways during the year amounted to £3,965,164, and the expenditure to £3,498,693. The expenditure by the councils acting as municipal authorities in 1903-4 which is charged, or was intended ultimately to be charged, to loan accounts was £4,436,662, of which £595,470 was for elementary education, and £2,879,697 for tramways and light railways. Other purposes for which money was borrowed included municipal buildings, lunatic asylums, bridges and ferries, police stations, and public libraries. Irrespective of advances to school boards and other local authorities, the expenditure defrayed by borough councils out of loans during the year for purposes other than elementary education shows a decrease of £932,228 when compared with 1902-3. In the earlier period the outlay on tramways was £4,709,551. The total amount raised by loans by the councils in their municipal capacity during the period under review was £4,365,724, of which £375,846 was for purposes of elementary education; the sum so raised (excluding the item of elementary education) being £708,534 less than in 1902-3. The total loans outstanding at the end of the period to which the Blue-Book refers amounted to £52,068,508, of which £17,349,484 was for tramways and light railways, and £15,193,769 for education.

We come now to the accounts of borough councils acting as urban sanitary authorities or urban district councils; under the Burial Acts; as harbour, pier, or dock, &c., authorities; and as port sanitary authorities. The financial transactions recorded here are of much greater magnitude than those noticed above; for though, of course, a considerable portion of the expenditure was defrayed out of the rates for purposes of public health and sanitary improvements, a large part was, to a greater or less extent, "reproductive"—that is to say, it was spent on such undertakings as water-works, gas-works, electric lighting, harbours, piers, docks, &c., which in some cases operated towards a reduction of the rates. The receipts of the borough councils, acting otherwise than as municipal authorities, for the year 1903-4 amounted to £27,114,903. Of this, £10,517,769 was from general district and borough rates, £6,522,733 from gas-works, £3,562,595 from water-works, and £1,797,680 from electric light undertakings. The receipts of the councils from rates in 1902-3 were £9,918,174, so there was a very appreciable increase in the period under review. The expenditure in 1903-4 (excluding that defrayed out of loans) was £26,825,377; and this included £5,757,262 on gas-works, £3,624,701 on water-works, and £1,706,820 on electric light undertakings (other than for public lighting). The cost of public lighting, including electricity, was £1,075,323. The total increase in expenditure, as compared with 1902-3, was £894,115. The charges that were met out of revenue on account of loans were as follows: Gas-works, £1,119,371; water-works, £2,316,435; electric light undertakings, £991,875.

The expenditure during the year out of borrowed moneys by councils of boroughs acting as urban sanitary authorities, &c., was £11,330,406, of which £522,513 was for gas-works, £2,816,962 for water-works, and £2,363,950 for electric lighting (including expenditure on public electric lighting). Irrespective of advances made to other local authorities, this expenditure out of loans was £1,469,891 less than in 1902-3. The total amount of the loans raised during the year by town councils, acting otherwise than as municipal authorities, was £11,726,539, of which £587,533 was for gas-works, £2,076,850 for water-works, and £2,868,076 for electric lighting (including public electric lighting). This total was less by £961,705 than the sum borrowed during the preceding twelve months. The loans of the councils of boroughs, acting otherwise than as municipal authorities, outstanding at the end of the year amounted to £167,840,835. Of this, £19,396,472 was for gas-works, £54,486,139 for water-works, and £17,109,353 for electric lighting (including public electric lighting). As compared with the preceding year, there was a net increase in the outstanding debt of £9,121,444, of which £5,133,232 was in respect of "reproductive" undertakings.

The total population (according to the census of 1901) of the 69 county boroughs to which these statistics refer was 9,345,105, and of the 254 other boroughs 4,218,247, or an aggregate of 13,563,352. The total rateable value of land and other property was £66,900,366. The average borough rate of the county boroughs was 2s. 6·3d. in the pound; and of the other boroughs, 1s. 3·5d. The average general district rate of county boroughs was 3s. 2·7d. in the pound; and of other boroughs 3s. 3·4d.

Some figures regarding the accounts of urban district councils for districts other than boroughs may be given in our next issue.

THE PROTECTION OF INVENTIONS.

The faulty condition of the patent laws of this country, and the indifferent protection they afford to the true inventor, supply the material for one of those interminable questions that after a time palls on one, if there is not some inducement of a personal nature to sustain interest. But most gas engineers are, in some way or other, mixed up with invention—as inventors or as users of patented appliances and apparatus; and so it may be expected that their interest in the question never flags. It is a subject, too, that the deeper one penetrates it, the more it broadens; and it is remarkable what a number of men can deal with the questions involved, and each one have something fresh to say upon them. The end of it all is that the need for reformation is proved; and therefore reformation is desired.

The protection of invention was the title of an extensive paper that Mr. B. E. Dunbar Kilburn, M.A., read to the Junior Institution of Engineers last Tuesday; but, interesting as the whole paper is, we cannot do more than point the features of his criticism of the Act of 1905. That Act, it was anticipated, would prove of great advantage to all inventors, and make their position more stable. But Mr. Dunbar Kilburn, like most other people who have discussed the matter during the past year or so, concludes that the measure is a complete failure. Formerly it was the practice to grant patents to anyone without any official consideration of the novelty of the subject of the patent; and therefore the new Act, introducing official search into novelty before a patent was granted, was popularly hailed with pleasure. But in a short twenty months or so since this fresh enactment came into force, the public mind has begun to be disillusioned. By the Act the inventor has not got all that he thought was going to be given to him; or, put in another way, he is not benefiting financially or otherwise in the manner he was led to expect he would. Most inventors protect themselves at the outset by lodging with their several applications a draft provisional specification, which secures the inventor's position for six months in which to develop the invention, sound the market, and get the invention tried. But at this stage, the Patent Office does not make any examination as to novelty; it merely gives the inventor a form of acceptance, and leaves him in exactly the position that he was in under the old law. The inventor proceeds to spend in development the six months granted to him, and perhaps also expend a great deal of money. Then he files his complete specification; and not till after all this does he learn the result of the official search, which may be unfavourable. Now why, asks Mr. Kilburn, should it be necessary for the inventor to advance as far as this in ignorance, if it is the official intention to enlighten his ignorance at all. This seems under the changed conditions to indicate the uselessness of provisional protection; but that is a question involving a multitudes of issues—legal, expedient, and what not.

There is no doubt that, so far as provisional protection is concerned under the new Act, the inventor is really rather worse off than he was under the old Act, since he was formerly allowed nine months' provisional protection, whereas now he has only six months. Of course, the alternative is for an inventor to accompany his application in the first instance with a complete specification; but, in addition to the increased cost, the invention has to be in such a tangible state that the specification shall "particularly describe and ascertain the nature of the invention, and in what manner the same is performed." There are not many inventions, in the short time after their inception when it is usually desired to seek protection, that are in a sufficiently developed state to have a proper complete specification and drawing prepared. However, it is the view of an expert when we find Mr. Kilburn saying that, if the provisional form of protection were entirely dispensed with, inventors would soon get accustomed to having their ideas in concrete form before seeking protection; and they would be less hasty in rushing to the Patent Office at the earliest possible moment. If this state of things ever comes to pass, it is quite probable that in a short time it will be cause for wonder how provisional protection ever came to be regarded as of any practical value. The new system of examination is undoubtedly causing an increase in the number of complete applications in the first instance, as was only to be expected; and certainly, when circumstances permit, the inventor may be recommended to prefer protection in this form at the outset, and not merely provisional protection.

There is no doubt that the whole of our patent procedure needs radical change. Is there ground for hope of something being done in the report that it is the intention of the Government to introduce a Bill into Parliament next year dealing with the grievances of the manufacturing and commercial community in regard to the working of the Patent Acts?

USE OF TAR FOR ROAD SURFACES.

In the "JOURNAL" a fortnight ago, brief reference was made to some remarks on the above subject, by Mr. Reginald Brown, Assoc.M.Inst.C.E., the Engineer and Surveyor of the Southall-Norwood Urban District Council, and by Mr. William Calder, Assoc.M.Inst.C.E., the City Engineer of Prahran, Victoria, at a meeting of the Association of Municipal and County Engineers recently held at Windsor.

In response to an application to Mr. Brown, he informed us that the material used for laying dust in his district is oil-tar. This, as a rule, is a waste product; but at the local gas-works boilers fired by means of this material have been installed. The usual waste oil-tar—that is, where such oil is not employed for boiler purposes—contains a very large percentage of useless substance, such as water; the liquid holding only some 25 per cent. of oil-tar. At the local gas-works, the water is eliminated as far as possible; and so they are able to get a liquid containing some 95 per cent. of oil-tar and only 5 per cent. of water. This, as Mr. Brown says, is a most important point, as to this fact is due the success of dust-laying. The waste product is wholly useless for the purpose; but as the material is probably produced at almost all gas-works, there is no reason why means should not be provided to allow the oil-tar to separate. For Mr. Brown's first experiment he paid ¾d. per gallon for the liquid; but he has now made arrangements with the Gas Company to take all they have to spare at 1d. per gallon. It is put on the roads by means of the ordinary water-cart, having the side holes stopped up so as to prevent as far as possible the liquid being spread upon the side-walks. The road is first thoroughly swept and the dust picked up; and after the liquid has been applied, the men go over the surface with brooms, well rubbing the liquid in. The appearance of the road after the liquid has been applied is that of a newly-laid wood pavement (creosoted deal), and has the same odour. For main roads it is advisable to put on the liquid during the night, so as to cause as little inconvenience to the traffic as possible; but the side streets may be treated during the day. He first tried drenching the road with the liquid. This worked out at ¾d. per superficial yard, including everything—labour for sweeping up the dust, carting, spreading the oil, &c. Mr. Brown says if done in this way, the treatment is good for from four to five weeks; and it shows a very great saving even in the cost of watering, without counting anything for the absence of dust, the deadening of the noise of the traffic, the preservation of the road surface, prevention of the formation of mud in wet weather, and the powerful disinfecting qualities of the liquid. He is now putting on the liquid in a slightly different way—that is to say, instead of drenching the road at the first operation, he passes the water-carts over it with the liquid once only, giving another dressing at the end of a week. He says, however, he is not sure that the first method is not the best and more effective for the purpose. Of course, the subsequent dressings do not require so much liquid. He estimates that they will require some five waterings or dressings during the summer months, and this will cost about 1d. per superficial yard in all. Watering by the ordinary means costs very much more.

In a communication to our contemporary "The Surveyor," Mr. Calder furnished the following further information as to the use of tar for dust-laying purposes in the town which is under his supervision. He had had experience for six or seven years of the use of distilled tar as a top dressing for wood pavements, and recognized the benefits of this method of treatment. The life of the wood blocks is increased, the joints are filled, the pavements are consequently more easily cleansed, and the noise and clatter resulting from vehicular traffic lessened. For several years he experimented with the same material for coating macadam roads, with, he considers, satisfactory results. Last December a portion of one of the main thoroughfares in Prahran, about a quarter-of-a-mile in length, was coated in this way, and after a wet winter a correspondent, writing in August, informed him that the road surface was still perfect—the rain causing no evil effects upon it. From his short experience of this way of treating macadamized roads, he considers there are certain essentials to success. The surface to be treated must be even, in good order and thoroughly dry. Above all, the tar should be distilled to a certain extent only. The whole of the watery constituents are taken out, but only a small proportion of the contained oils. Should the distillation be carried too far, the tar loses its elasticity and is made brittle. With the average coal tar obtained in Melbourne, about 15 to even 20 per cent. of the crude tar is extracted. The tar is taken in ordinary tank carts to the road to be treated. They have a small grate beneath the tank containing a wood fire to keep the tar sufficiently liquid. After the road surface has been swept, the tar is flushed on, swept in with hand brooms, and coarse sand thrown on the top. The road is not closed for traffic.

Writing recently in the "Daily Mail," Major Matson, referring to the tarring over of portions of well-made main roads to provide a dustless surface, stated that while during an exceptionally fine season the system had been found satisfactory, there was, unfortunately, evidence that it was not so durable as anything of the sort must necessarily be if it was to satisfy our hopes. It appears that many villages along the Portsmouth main-road have protected themselves against dust by this method; but now signs are not wanting that, under the pounding of horses' hoofs, in combination with a little spell of wet, the surfaces are "going to pieces," and trouble will result. Major Matson thinks that if we are to have dustless highways, tar, though good in itself, is not good enough, and must be incorporated with some other material. This is effected in the case of tarmac, which is manufactured from ironstone slag impregnated with oils of tar. As regards laying this material, every ton of granite costs in steam-rolling alone, taking an average of 30 tons a day, 9½d. a ton; whereas 50 tons of tarmac can be easily consolidated in the same time at a cost of 4d. a ton. The County Surveyor of Nottingham found that the prime cost of tarmac was 11s. 10d., as against £1 for granite, and other expenses, including the rolling alluded to, were so much less that the total cost for tarmac came out at 16s. 2d., as against £1 12s. 1d. for granite. The Nottinghamshire County Council have now decided to lay down 14,000 tons of tarmac, the alternative of 18,600 tons of granite being rejected.

Mr. A. E. Prescott, the Borough Surveyor of Eastbourne, holds the opinion that tar will in the future (as it does now) play a most important part in the upkeep of roads; and he proposes during the coming winter to make provision for the manufacture of tarred stone. In a report on the subject which he has made to the Town Council, he says: "As far as my experience and observation of the steps taken by other towns to combat the dust nuisance is concerned, I think Eastbourne is well to the fore; and it is satisfactory to know that I have received a number of communications from people who have visited our town, seeking for information and commenting most favourably on the excellent results obtained. I should like to state that, in the event of the roads already treated proving successful during the coming winter, I shall extend this class of road-making in the spring of next year."

An important development of the experiments made by the Surveyor to the Beckenham Urban District Council (Mr. John A. Angel) in the use of tar for the prevention of the motor-car dust nuisance, has been reached by the invention of a special machine for distributing the tar. It has been made by a resident at Beckenham, aided by a Birmingham engineer. It consists of a tank-waggon containing a tank for the tar and a pump for compressed air. As the vehicle proceeds, the pump is worked through gear attached to the wheels, and the tar is distributed, almost in the form of vapour, from a number of nozzles; the compressed air acting on the tar somewhat after the manner of a scent spray. The result is that, instead of a number of men laboriously distributing the tar with squeegees, the thick liquid is spread with the ease almost of water over a track about 5 feet wide with the same speed as that at which a slow vehicle travels. A trial of the machine was carried out a few days ago by Mr. Angel, in the presence of several other engineers; and it showed that a road 150 yards long and 8 yards wide can be twice coated with tar in half-an-hour, or at the rate of a mile of road 8 yards wide in six hours. On this basis, the whole of the public roads of Beckenham could be twice coated in 14 days of 10 working hours, or the whole of the public and private roads, about 48 miles in extent, twice in 28 days. The length of roads coated in Beckenham during the recent summer was about 4¼ miles, occupying 42 working days of 10 hours each, covering an actual period (due to intermittent work from wet weather) of eight weeks. With the new machine, it would be possible to cover 70 miles of road in the same time. The cost of tar painting the 4¼ miles of road amounted to £250 (two coats), against the estimated cost of £125 for the same length of road if done by the cart—the machine thus enabling the work to proceed at about sixteen times the pace and at half the cost. It may be mentioned that in the Birmingham district the feat of spraying a mile of road 8 yards wide in an hour was accomplished with the machine; whereas under the old method it would have required two or three weeks.

While dealing with the subject of the treatment of road surfaces for the prevention of dust, reference may be made to an inspection which took place recently at Westcliffe-on-Sea of a portion of the road between that place and Leigh, to which a new material called "Taafalt" had been applied. It consists mainly of tar, in a proportion not exceeding 12 per cent. of the whole, powdered limestone or granite, powdered furnace slag, and an alkaline solution. These are mixed and heated to upwards of 300° Fahr. in a vacuum. Chemical changes occur, and when amalgamation is complete the material is poured into moulds, and thus formed into blocks. It can then be stored ready for use, or the necessary materials can be mixed at the roadside and applied direct to the road. "Taafalt" may thus be used merely as a road surface or in combination with road materials, such as granite or limestone. In either case the road so treated is said to be ready for traffic in about twelve hours, while the cost will compare favourably with other methods of road making, or with materials used for this purpose. On the occasion above referred to, the road had been laid sufficiently long to test the effects of extreme heat and cold, while, being on the Promenade, salt water had also been brought into contact with it. The material seemed to have resisted the usually destructive effects accompanying such conditions. As a road surface simply, it may be applied at an average expense, it is stated, of 4d. per square yard; while when used as a binding material, an entirely new road may be laid at an initial cost of from 3s. to 4s. per yard. We understand that arrangements are in progress for a trial of "Taafalt" on some of the roads under the supervision of the Surrey County Council and the Esher and Dittons Urban District Council.

EXTENSIONS AT THE HOLLINWOOD GAS-WORKS OF THE OLDHAM CORPORATION.

An Installation of West's Combined Charging and Drawing Machines.

THE increase in the output of gas from a retort-house, and the reduction of labour charges, are questions which have frequently to be considered by engineers of gas-works where the available area is already utilized. Another example of the re-modelling of a retort-house and coal-store, with the attendant increase in efficiency and reduction of the cost of gas manufacture, has been successfully accomplished at the Hollinwood Gas-Works of the Oldham Corporation, under the direction of Mr. T. Duxbury, the Engineer to the Gas Department.

A few particulars in connection with this retort-house will be of interest to many faced with similar problems to those which had to be solved at these works. All the retorts at the station (616 mouthpieces) were formerly hand charged and direct fired; the coal and coke being wheeled in barrows to and from the retort-house. The remodelled retort-house, which was erected in the year 1873, is 225 ft. 6 in. long by 60 ft. 6 in. wide, and contained before the alterations twelve settings of sixes and eight settings of threes—the production being a million cubic feet of gas per day. Alongside the retort-house is the coal-store, 60 ft. 4 in. wide, to which the coal was brought in carts and stored by hand labour; and from the store the coal was wheeled in barrows—the retort-house then being a ground-floor house on the same level as the coal-store.

Before he decided as to the system of carbonizing plant and machinery to adopt, Mr. Duxbury had under consideration the systems of inclined retorts and horizontal retorts with stoking machinery. His practical experience with both these systems confirmed him in his opinion that horizontal retorts with stoking machinery were the most suitable for the retort-house in question, and that West's combined charging and drawing machines, similar to those in operation at Wellingborough and other places, were best suited to the requirements at Oldham. Tenders were also obtained for the various projectors and dischargers, and visits were made to different works. The retort-house was thereupon designed to finally contain sixteen through settings of eight horizontal retorts, 20 feet in length; but only one-half of this number of settings has so far been erected. Tenders have now been obtained for the remaining half, which will shortly be put in hand, when the carbonizing power will be increased to over 2 million feet per day, or double its former capacity.

Owing to the works not being connected with the railway, the coal is brought in carts, which discharge their contents into a hopper, below which there is an automatic feeder for feeding the coal to a breaker capable of dealing with 30 tons of coal per hour. From this breaker, the coal is raised by an elevator and brought to the store by a conveyor extending the whole length of the building, and provided with a travelling apparatus for delivering the coal from the conveyor at any part of the store. This is, however, generally kept stationary opposite the elevator which raises the coal to the hoppers in the retort-house. This daily supply to the retort-house is effected with as small an amount of labour as possible, as there is a shield over the elevator, over which a great quantity of coal can be stored. The coal-store plant is driven by a gas-engine alongside the breaker.

The charging floor of the retort-house was raised by the construction of a stage floor 9 feet high from the basement level; and

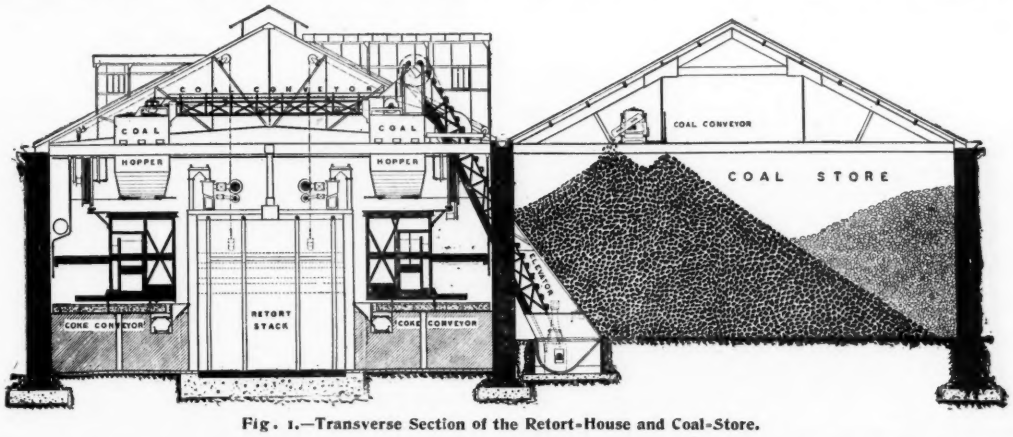


Fig. 1.—Transverse Section of the Retort-House and Coal-Store.

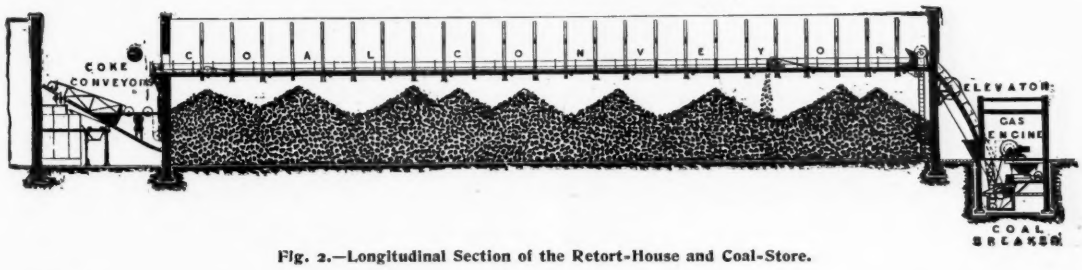


Fig. 2.—Longitudinal Section of the Retort-House and Coal-Store.

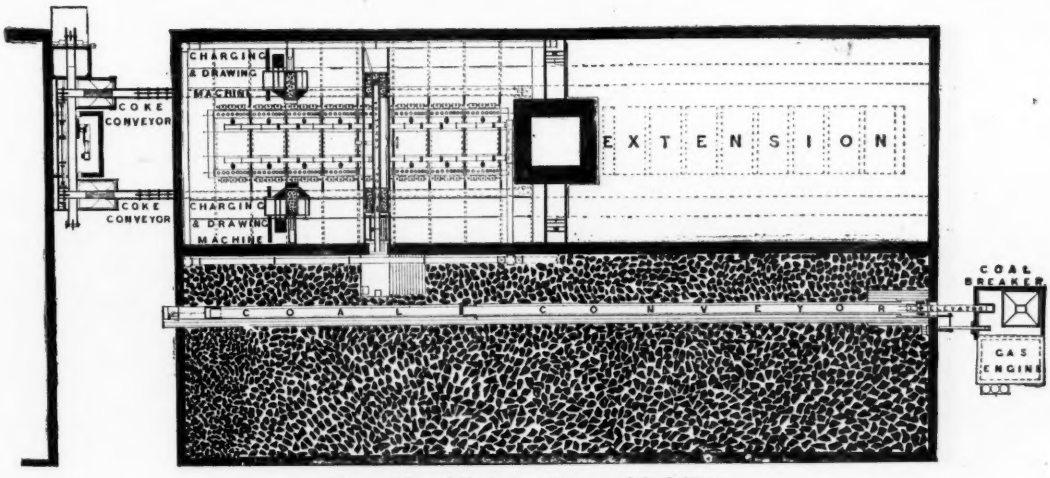


Fig. 3.—Plan of the Retort-House and Coal-Store.

Fig. 4.—The Coal-Store Elevator.

though this height was restricted to prevent the raising of the roof, it has been found ample for the introduction of coke-conveyors below the stage floor. Each setting contains eight 22-inch by 16-inch retorts; and these, with the main arches and furnaces and regenerators on the Waddell system of construction, together with the stage floor, were erected by Messrs. Dempster and Sons, Limited, of Elland.

The coal is elevated from the coal-store by an elevator, and conveyed across the retort-bench to the coal-hoppers to supply the charging machines. This coal plant is driven by a steam-engine; and, as the coal is already broken by a coal-store breaker, no further breakage is necessary. Eventually two sets of the elevating plant will be fitted in the retort-house.

The charging and drawing machines are of the West's combined type, driven by compressed air generated by an air-compressor fixed in the exhauster-house. These machines are fitted with West's twin-scoop chargers, which lay a very even charge in the retort at one stroke; and the coke is drawn by the rake

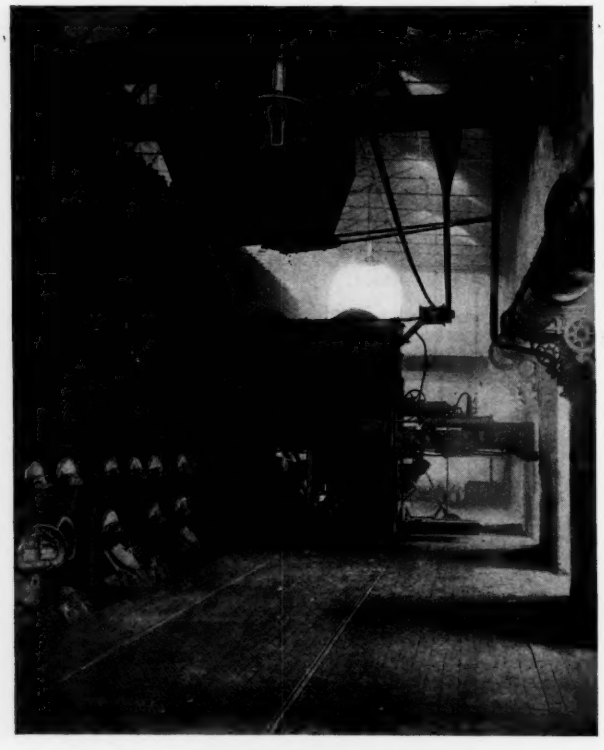


Fig. 5.—Interior of the Retort-House, Showing West's Combined Charging and Drawing Machine.

either direct into the furnaces or to shoots which direct it to the West's hot-coke conveyors below the stage floor. These convey the coke to a cross conveyor, which delivers into a small storage hopper from which skips are filled.

Arrangements are provided in the coke-handling plant for screening the coke and storing the breeze in hoppers which have outlets for the filling of carts. The coke plant is driven by a steam-engine, and is the second installation of the West's coke-conveyors installed by the Corporation.

The cost of carbonizing in this house already shows a saving of 55 per cent., or 1s. 10d. per ton, against the old system of working; also 2500 feet, or 45 per cent., more gas is made per mouthpiece. It is estimated that the saving will be at least 70 per cent., or 2s. 4d. per ton, when the whole retort-house is completed, together with an increase of 38,000 feet of gas per man, or over 200 per cent.

The contracts for the coal-handling plant, both for the coal-store and the retort-house, the combined charging and drawing machines, and the coke-conveyors, were carried out by West's Gas Improvement Company, of Manchester, who have supplied similar plants to the Corporation's Higginshaw works.

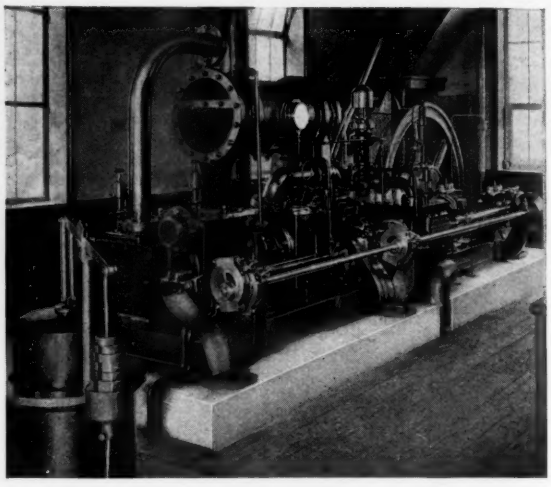


Fig. 6.—West's Air-Compressor.

We give some illustrations, with plan and sections of the retort-house, which has now been in continuous operation for twelve months, and has realized all that was anticipated of it.

Other considerable improvements and extensions have been carried out at this station within the last two years, consisting of two water-tube vertical condensers by Messrs. Clapham Bros., of Keighley, each having a capacity of 1½ million cubic feet per day; one four-blade rotary exhauster by Messrs. George Waller and Son, having a capacity of 3 million cubic feet; one 3 million cubic feet washer-scrubber by Messrs. W. C. Holmes and Co., of Huddersfield; two Lancashire boilers by the Oldham Boiler Works Company, each being 30 ft. by 8 ft. and 100 lbs. working pressure, and fitted with Wilton's forced draught for burning coke breeze. New lavatories, baths, and stokers' dining-room have now been completed. A contract has also just been let to Messrs. Holmes and Co. for a 2 million feet Livesey washer for dealing with naphthalene by the Derby process; and drawings are being prepared for four large purifiers, each 28 ft. by 25 ft. by 6 ft. square, to replace four existing small purifiers. A plot of land near the works has just been purchased, on which it is proposed to erect a gasholder of from 4 to 5 million cubic feet capacity.

Messrs. Alexander Wright and Co.'s New Catalogue.—We have received from Messrs. Alexander Wright and Co., Limited, their new catalogue and price list of photometrical, analytical, laboratory, and other apparatus, as well as of the patents of Messrs. Simmance and Abady, for which they are the agents. It is a very comprehensive production, extending to 166 large quarto pages; and the number and variety of the appliances illustrated and described may be appreciated from the fact that the index occupies six pages. We have so recently given a representative collection of the firm's testing apparatus (see *ante*, p. 97), that it is unnecessary to refer to the catalogue in detail. It may be pointed out, however, that it is far removed from an ordinary trade list, as, in addition to particulars furnished in regard to the different articles, ample instructions—amounting in some instances to short treatises—are given for their use. This is especially the case with the photometrical apparatus. The book is very well got up, and brings before the user all the information he can desire on the subject of the special class of goods with the production of which the firm (of which, as most of our readers are aware, Mr. John F. Simmance, Assoc.M.Inst.C.E., is the Managing Director) have been identified for more than sixty years.

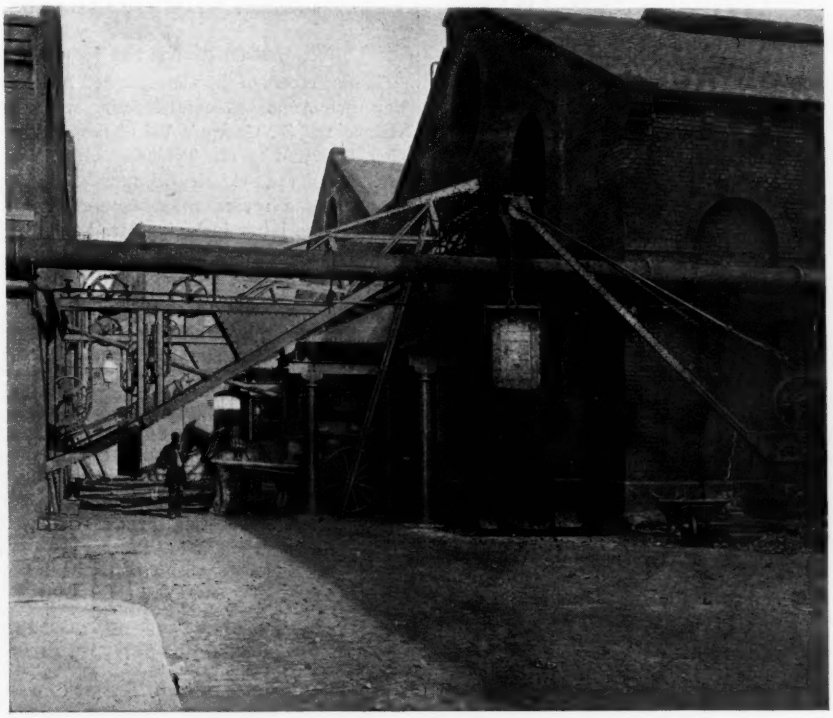


Fig. 7.—West's Coke-Conveying Machine at the Hollinwood (Oldham) Gas-Works.

THE "HONEC" SHADOWLESS INVERTED LAMP.

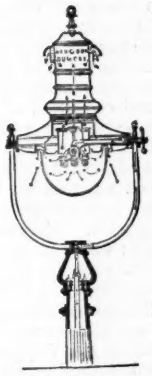
In street illumination, there is no doubt whatever that the inverted gas-burner will in the future play a most important part, on account of the excellence of the distribution of illumination that is obtained. By the inverted burner at all angles from the horizontal, good lighting power is realized; and that is only what one would naturally expect when the character of the incandescent body is studied. Granting this, the next thing is to find the most suitable lantern for enclosing the inverted incandescent burners. The lamp must be well ventilated, and yet there must not be draughts to cause fluctuating flames and consequently lights; and the design must be such that shadows may be, as far as possible, eliminated. Messrs. A. & E. Cohen, of 2, Bury Street, St. Mary Axe, E.C., have for months past been applying themselves to producing a lamp which should possess this combination of essential qualities; and in the "Honec" lamp they claim to have succeeded. The largest of the illustrations shows the outward form. Generally described, it is a hooded lamp, with bowl-shaped glass suspended between two curved arms. It is a bold design; and a fitting headpiece for a street-lamp column. Moreover, this form of lamp takes us completely away from the types that have deviated little from the originals in outline. The evolution of street lanterns has been mostly along one direct line; and to a large extent perhaps this has been due to the universality of the vertical type of burner, until the inverted came along, and started to attack the beforetime sole possession of the vertical burner.

There are only one or two points to notice about the external form of the "Honec" lamp. It will be seen that the two arms of the lamps are well spread out, so as to give good distance between the centres of light and the arms. This distance tends to reduce shadows to a minimum; and then, by so disposing the lamp that the arms are lengthwise of the street, such faint shadow as there may be is entirely lost along the kerb of the footpath.

The two points that caused the greatest difficulty in producing the lamp were the ventilation of the lantern and the type of the burner; and months of experiment were spent in overcoming these. The result is that the makers have perfectly satisfied themselves on both heads, and are assured they have now a good lamp to offer. The Welsbach-Kern burner, specially adapted to this form of lamp structure, is the one that the firm have decided is the most efficient for their purpose. The lamp can be fitted with two, three, or four of these burners; but the standard form of construction will be a three-burner lamp—this being the most economical from the point of view of effective lighting power relatively to gas consumption. The illuminating power for the three-burnered lamp, it may be mentioned at this point, is 225 candles for a consumption of 9 cubic feet per hour, or 25 candles per foot of gas consumed, which is not by any means an extravagant rating, and its modesty gives confidence. Looking at the large illustration, the gas supply to the lamp is carried up the right-hand side arm, and is controlled by a cock (shown) at the top. From there the gas supply is led, inside the lamp, round a tube-hoop, to which, at equi-distances, the Welsbach-Kern burners, with their curved ends, are attached. The air-inlets to the lantern are so disposed round the under-frame of the hood, that a fresh supply of air is given direct to the burners and to the flames, and at the same time the air currents contribute to the velocity of the

The "Honec" Inverted Lamp.

The Lamp with the Globe Lowered.



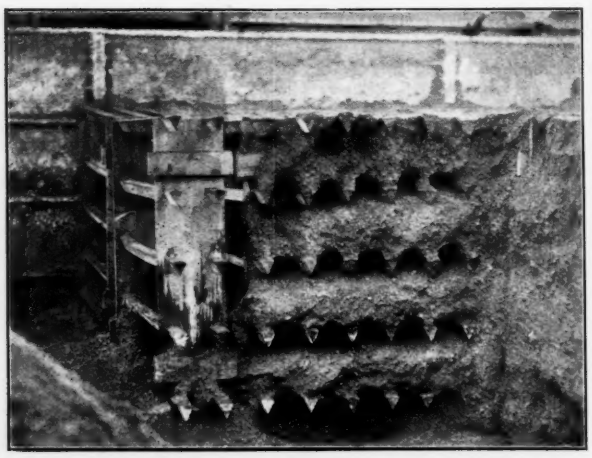
The Air Supply and Ventilation of the Lamp.

up-draught for the rapid removal of the products of combustion. The burners are all lighted from one flash bye-pass, which is regulated by a screw near the cock. The first movement of the cock shoots a flame right between the burners, and so ignites all three simultaneously. The consumption of gas by this arrangement is very moderate, as during the time the lamp is not in use, there is nothing but a small blue flame to be seen. The lantern is wind and dust proof.

The lamp has been seen burning. The incandescence of the mantles was perfect, and the illuminating power was good. Looking at the general appearance of the lamp, the verdict must be that it is one that invites interest, and satisfies the fancy.

"STANDARD" PURIFIER-GRIDS.

Readers will remember that the form of purifier-grids known as the "Standard" was patented in this country by Mr. F. D. Marshall about two-and-a-half years since. A considerable number of gas-works have adopted the system; among the first engineers to apply it to purification operations being Mr. A. A. Johnston, of the Ilford Gas Company, and Mr. T. H. Martin, of the Barnet District Gas and Water Company. Mr. Johnston had been contemplating putting down new purifiers; but he found, by the application of the new form of grids, that new purifiers were unnecessary, notwithstanding his greatly increased production of gas. This was a very satisfactory saving of capital. When Mr. Marshall introduced the system, there was some difference of opinion in technical circles regarding the possibility of the oxide bridging across the widely-spaced special form of bars, and forming substantial arches for supporting the mass above.



It is understood that Mr. Marshall bases his claims partly on the section and disposition of the staves or bars forming the grids, but principally on the fact of the formation of the arches, which he maintains is the keystone of the discovery. An attempt was made before the Comptroller of Patents to upset his claims to a patent; but the result, we learn, was in his favour—the actual formation of "substantial arches" as claimed, being, in the Comptroller's opinion, fully established. More definite and practical evidence, however, upholding Mr. Marshall's contention, was obtained from a purifier at Kingston-on-Thames. When partially emptied, Mr. Marshall—through the courtesy of the Engineer, Mr. Packham—was enabled to obtain a photograph taken of the remaining contents; and this photograph we have pleasure in reproducing. The purifier had been in constant work from May to October, and had passed 154,800,000 cubic feet of gas. In connection with the controversy referred to, the photograph (which was forwarded to us by Messrs. Kirkham, Hulett, and Chandler, the sole licensees for the "Standard" grids), showing as it does the actual condition of the material in a purifier using these grids, will be peculiarly interesting.

It is understood that there are now about 500 purifiers at home and abroad fitted on this system. The new form of grids (for which a patent has been acquired) are made in vertical form, with or without narrowly spaced bars at foot corresponding with ordinary grids. With this addition, it is unnecessary to use any of the latter; and, consequently, the patentee claims that a considerable capital saving is effected in the construction of new purifiers, as no T-bearers or standards are required.

The labour charges for the filling and emptying of the purifiers, we are also informed, are considerably reduced, as little or no shovelling is required as the grids to which the oxide clings are simply tipped into a shallow receptacle, which is hoisted and removed from the purifier by a light travelling "monkey block," running on a rail attached to the ordinary crane or gantry used for lifting the purifier covers. The grids, from which the oxide easily detaches itself, need not be removed from the purifier, but merely shifted from side to side.

MANCHESTER JUNIOR GAS ASSOCIATION.

Annual Meeting and Visit to Tyldesley.

The members of the above-named Association held last Saturday their Annual General Meeting, which was combined with a visit to the St. George's Pit of the Astley and Tyldesley Coal Company and to the Tyldesley Gas-Works, through the kind invitation of the Tyldesley-with-Shakerley Urban District Council. There was a record attendance of 64 members, exclusive of visitors; the latter including Mr. J. H. Brearley, the President of the Manchester District Institution of Gas Engineers, and Mr. Tim Duxbury, the Gas Engineer of the Oldham Corporation.

The Visit to the Coal Mine.

The members were first conducted to the St. George's Pit, where they were met by the General Manager (Mr. Peace) and the Under-Manager (Mr. Walshaw). They were then provided with lamps and taken down the mine. They divided into two parties—one party visiting the coal seam, and the other a new shaft which is being deepened from 500 to 700 yards. To most of the members this visit was of great interest, and the numerous questions asked by them were ably answered by the Mine Manager and his assistants.

Visit to the Tyldesley Gas-Works.

The members were met at the works by Mr. Sims, a member of the District Council, and Mr. R. H. Ginman, the Gas Engineer and Manager. Mr. Sims accorded them a hearty welcome on behalf of the Council, and the members proceeded to inspect the works. The gas supply dates back to 1849, when the Tyldesley Gas Company was formed with a capital of £1500. On May 29, 1865, the works were transferred to the Local Board at a cost of £7000. Gas at that time was sold at from 5s. to 6s. per 1000 cubic feet; and the shareholders never received more than from 2 to 2½ per cent. dividend. The water supply dates from July 2, 1868, when an agreement in regard to it was made by the Tyldesley Local Board with the Manchester Corporation. The consumption of water in 1869 was about 55 million gallons per annum; and at the present time, it is 182 millions. The Tyldesley Council supply 72¾ million gallons per annum to the Atherton District Council, 6¾ millions to the Leigh Rural District Council, and 2¼ millions to the Leigh Joint Hospital Board. The domestic consumption per head per day in Tyldesley is at present 9·75 gallons.

The present gas-works were opened on Sept. 6, 1881; the site being a little more than 3 acres in extent—sufficient for the manufacture, purification, and storage of a million cubic feet of gas per day. The present maximum day's supply is about 250,000 cubic feet; the make per annum being now 43 million cubic feet. The carbonizing plant consists of 56 mouthpieces, four double settings of seven retorts, back to back, capable of producing 330,000 cubic feet per diem, fired by generator furnaces. The average yield from a ton of screened Arley gas coal is 11,000 cubic feet; and the sale of coke is 9 cwt. per ton of coal carbonized.

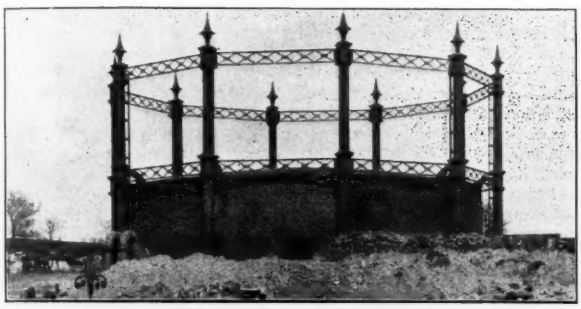
The condensers are of the annular type, and comprise six vertical tubes, 22 ft. 6 in. high; the outer tube being 32 inches, and the inner one 23 inches in diameter. In addition there are 200 feet of 18-inch steel foul main passing round the interior of the retort-house. This is ample for condensation, without the annular condensers; the temperature rarely rising above that of the atmosphere. The exhausters are two in number; No. 1 being of Messrs. R. Dempster and Sons' reciprocating type, with a nominal capacity of 50,000 cubic feet per hour. No. 2 is a Donkin combined engine and exhauster of the rotary type, which was put down in August, 1897. Its nominal capacity is 15,000 cubic feet per hour.

The washer is of the Livesey type. Its dimensions are 8 ft. 1 in. by 5 ft. 7 in., and 4 ft. 1 in. deep; and its nominal capacity is a million cubic feet per day. This machine, like the No. 1 exhauster, is out of level, through subsidence. The scrubber is 9 feet in diameter and 55 feet high to the platform. The filling is in three sections; 7½ feet at the bottom being filled with coke, and arranged so as to be renewable at any time by having the washer shut off for repairs or straightening without disturbing the two upper portions, which are filled with boards. Ammoniacal liquor is supplied over two-thirds of the scrubber, and clean water over the top portion. It is passed into the scrubber by means of one of Dempster's distributors. This apparatus was straightened, overhauled, and brought into use in May, 1905. The inlet and outlet connections were rearranged and made clear of the retort-house, where the outlet main, containing crude gas, passed in front of the retort-settings, and, on account of the building subsiding, was crushing and drawing the joints. This is regarded as a great improvement, as the scrubber was 24 inches out of the perpendicular. It is now quite straight, and in thoroughly good working order.

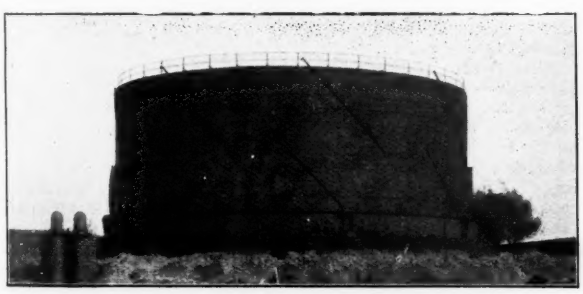
The purifiers are six in number—four 18 feet and two 24 feet square. In the original construction of the works, there were four 18-feet water-lute boxes with an 18-inch centre-valve worked in the usual way, three on and one off; and lime only being used for purification. In 1902, previous to Mr. Ginman's appointment, the Council purchased two purifiers 24 feet square and 5 feet deep, fitted with Clapham's "Eclipse" rubber joint and patent rapid automatic fasteners. These vessels were erected on

columns and a steel staging raised 10 feet above the ground. They were unfinished, and remained in this condition up to 1905, when, on account of the continued subsidence on and about the site of the old 18-feet purifiers and house, the Council decided on the reconstruction of the purifying plant on the south side of the works, which up to the present has shown no sign of moving. The purification is now done by the two 24-feet boxes filled with oxide of iron. The vessels were taken down and re-erected on the ground level, and the columns and joists used for carrying the roof principals. It will thus be seen that there is ample purifying area and plant. Commencing with new oxide, it has been possible to go three months without changing a purifier; and as the oxide gets into better working order this will be improved upon. In the reconstruction of this plant, Mr. Ginman was guided by the expressed opinion of Sir George Livesey, "that where ample ground space is available there is no necessity for purifiers to be elevated, necessitating expensive elevating plant, gearing, and machinery, staircase, &c."

The station meter is by Messrs. J. & J. Braddock, and is of 20,000 cubic feet capacity per hour. The connections are 18-inch throughout the works, and in most cases are covered by iron gratings only, to allow for inspection. There are two holders. No. 1 is a two-lift, the inner lift being 88 ft. 6 in. and the outer lift 90 feet in diameter, of 240,000 cubic feet capacity. The tank was originally of brick and puddle; but this was damaged by subsidence to such an extent that a new steel tank was put inside



The Two Lift Gasholder in New Steel Tank.



The Spiral-Guided Gasholder.

the old one, and the holder, after being out of action for about eighteen months, was brought into use on July 27, 1903. No. 2 holder was erected in 1901, and completed in three months. It is a spiral-guided holder in a steel tank, and has two lifts, each 18 feet deep; the inner lift being 78 feet and the outer lift 80 feet in diameter. The capacity of it is 160,000 cubic feet. The two governors are of the ordinary type; the pressure being put on and taken off either by weights or filling copper tanks to a previously determined level so as to give the pressure desired. One governor is a 12-inch, controlling the Tyldesley gas, and the other a 9-inch, controlling the Astley gas.

The tar and liquor are stored in three steel underground tanks, each 11 ft. 6 in. by 6 ft. 4 in., and 10 feet deep. From these, the tar and liquor are pumped into two cast-iron overhead tanks ready for loading. The tanks are 13 ft. by 6 ft., and 5 feet deep. The total storage of tar and liquor is about three weeks' maximum production. The original tar and liquor tanks were brick and concrete; but as these were of no use through the subsidence of the ground, the Council decided on the substitution of steel tanks, which were put down in 1901.

The total number of consumers at the present time is 2360, of whom 850 are on the prepayment system. Meter-rents were abolished Jan. 1, 1891, and cooker-rents followed on July 1, 1904. There are 306 cookers in use. The prices of gas are 2s. 11d. for cooking, heating, and power purposes, 3s. and 3s. 4d. for lighting, and 3s. 9d. with slot-meters; and the average price realized per 1000 cubic feet sold is 3s. 3·7d.

At the conclusion of the visit, the members were conducted to the George and Dragon Hotel, where a repast was provided by their host, Mr. Ginman.

Annual Meeting.

Mr. Thorpe proposed that the best thanks of the Association be given to Mr. Peace, Mr. Walshaw, and the staff of the St. George's Pit, for the enjoyable visit. Coupled with this, they had, he said, to thank the Tyldesley Urban District Council, and also Mr. Ginman, for his hospitality and kindness, both in conducting them round the works and providing the enjoyable repast of which they had partaken. For many of them it was the first time they had been down a pit, and it was an experience which they would never forget. With regard to the Gas Committee and the District Council, it was exceedingly kind of them to allow Mr. Ginman to invite the members to the works, which reminded them, through the subsidences, that they might have been in Valparaiso or San Francisco after the earthquake. Mr. Ginman must have had considerable difficulty with the works; and it reflected great credit on him for the satisfactory results he had produced. With respect to Mr. Ginman himself, they all appreciated him, and had done so for years past. From their experience they had found that he was not the man to stick in the rut, but went ahead irrespective of the remarks of other people.

Mr. D. V. Hollingworth expressed his pleasure in seconding the proposition.

Mr. Walshaw and Mr. Smith responded for the Colliery Company; and Mr. Ginman and Mr. Taylor for the Council.

Election of Office Bearers.

The next matter was the election of officers of the Association for the coming season; and it resulted as follows: Vice-President, Mr. E. J. Wellens; Treasurer, Mr. R. H. Garlick; and the Auditors, Messrs. C. Berry and J. Wareham. Out of seventeen nominations for the Council, Messrs. J. Alsop, J. E. Dudley, D. V. Hollingworth, F. Oldfield, J. Taylor, and F. Thorpe were elected.

Annual Report.

The Hon. Secretary (Mr. A. L. Holton) said that, in presenting the eighth annual report of the Association, the Council had great pleasure in being able to announce a large increase in membership. They commenced the year with 80 members, and they were starting the new year with a total of 107. This was largely the outcome of the circular-letter and application forms in September, 1905. The Council also took the opportunity of expressing their pleasure at the number of responsible appointments that had been obtained by members of the Association during the past year. From the accounts the members would notice that the balance in hand showed a decided improvement; and now they were so strong numerically that the question of printing their proceedings might be advantageously discussed.

Vote of Thanks to the Retiring President.

Mr. Mosley proposed a vote of thanks to the retiring President (Mr. Dudley). It was seconded by Mr. Wellens, and carried.

Mr. Dudley said he relinquished his position with pleasant thoughts of a pleasant year and an increase of 27 members. They had made several additions to the library, and there was a good balance on the right side of the accounts. He sincerely thanked the Council for the way in which they had supported him; and if the enthusiasm shown to him was continued to his successor, a bright year awaited them. He had very much pleasure in asking Mr. Ginman to take the chair as President of the Association.

Presidential Address.

Mr. Ginman said it was with great pleasure that he rose to address the members of the Association, his acquaintance with which extended over six years, the last two years as a member of the Council. He thanked them for electing him President, and trusted, with their co-operation, on which he knew he could rely, to maintain the Association in the position it now occupied, thanks mainly to his predecessors in the chair. His first thoughts turned on the work of the Association, which was formed in October, 1898, and at the present time numbered about 107 members, 27 having been added during the past year. There had been 42 visits to works. The following subjects and papers had also been dealt with:—

Chemical.—Gas Analysis, two; Flame, two; Classification of Coals, one; Cyanogen, one; Calorimetry, one; Chemistry of Carbonization, one; Naphthalene Extraction, one; and Refractory Materials, one.

Engineering.—Retort-House, one; Foundations, one; Designing a Roof, one; Steel Tubes, one; and Standardization of Meter Unions, one.

Gas-Works Processes.—Distribution, one; Revivification, one; Working Regenerator Furnaces, one; Gas Lighting, two; Gas Management, one.

Detailed Working.—Stopped Ascension-Pipes, one.

Miscellaneous.—Efficiency in Gas Manufacture, one; and Gas Examination, one.

Auxiliary Processes.—Carburetted Water Gas, one; Sulphate of Ammonia, one; Tar Distillation, one; Railway Carriage Lighting, one.

These did not by any means exhaust all the questions in gas matters; and he appealed to the members to come forward during the coming session with papers on subjects that had not been touched upon. He suggested the following as matters to be treated: Retort-house practice and carbonizing; condensation and purification; naphthalene and its elimination; washers and

scrubbers; the illuminating power and calorific value of gas; distribution; public and general lighting; commercial topics; and coal testing, &c. These were a few subjects, and others, no doubt, would suggest themselves. He hoped that each member would feel it incumbent upon him to do his best to keep the records of the Association up to and abreast of all modern requirements and the practice of their work.

The idea was suggested to him that in his address he should touch upon the reconstruction of the Tyldesley Gas-Works, which had been going on since May, 1901, as at that time, owing to subsidence through coal-mining operations and other causes, the works were, to all intents and purposes, a scrap-heap, and in a very neglected condition. At the time of his appointment, in December, 1902, £12,000 had been spent; and the interest and sinking fund charges amounted at that time to 1s. 2½d. per 1000 cubic feet of gas sold, and they had an adverse balance of £1469 on the revenue account to wipe off. The sale of gas per ton of coal carbonized was 8000 cubic feet; the coke sales were 6 cwt. per ton; and the consumption per consumer per annum was 15,000 cubic feet, as compared with 27,000 cubic feet, which was the present average annual consumption per consumer in the case of 260 local authorities. He had prepared from the Board of Trade returns an analysis of the working, receipts, and expenditure relating to the Tyldesley Gas-Works since 1882 up to the present date, on similar lines to those presented by Mr. Daniel Irving, of Bristol, in his Inaugural Address to the Institution of Gas Engineers last year; and he took the present opportunity of acknowledging his indebtedness to him for the information presented in that address. He would refer to this tabular statement as he went on, but did not intend to weary the members by wading through all the figures.

The first thing that had to be done in reconstructing the works was the erection of a spiral-guided gasholder, as the existing 240,000 feet holder in a brick and puddle tank was out of level, and the tank broken, necessitating three or four streams of water continually running into it. This work, which was in progress when he was appointed in 1902, was completed on July 27, 1903, and gas turned into the holder. The excavation and foundation work was done by the Council's own men. The making and fixing of the tank were carried out by Messrs. Clayton, Son, and Co., Limited, of Leeds. The method of procedure in the erection of the steel tank, 91 ft. 6 in. diameter and 20 ft. 6 in. deep, was as follows: The inner lift was raised 3 feet by means of screws. The outer lift was then attached to it with hooks, when both shells were raised 10 feet by means of twenty lifting-screws attached to the columns and holder with chains. As this was being done, a couple of jacks were fixed under the centre tube, which assisted the lifting at the same time. Then twenty props were fixed under the cup, resting on the concrete floor of the tank. The screws were then detached from the holder, and used for lowering the sides of the tank, which was built tier by tier, and lowered as each row of plates was riveted on. As soon as the shell was 2 feet from the bottom, one prop at a time was taken out, and the outer row of bottom plates bolted to the bottom curb. As the props were removed, others were put in above and below for supporting the holder. The whole of the bottom plates were then fixed on supports. In the floor of the tank were holes for passing the ends of the lowering screws, which rested on seatings. Special bridges were attached to the plates resting on the nuts on the screws. The tank was then bodily lowered on to its bed of concrete; and at the same time the holder was suspended from the columns. The holes in the bottom of the tank were made good by cover plates; and new tank guides were fixed to the side of the tank, with ears and set-screws. The holder was then lowered into position, and the cavity between the shell and the tank filled with cement. The duckfoot bend at the bottom of the inlet-pipe was cracked; and this was renewed and secured to the tank floor with angle clips. The cost of the construction and extension of the works was—

New spiral-guided gasholder and steel tank (165,000 cubic feet capacity)	£2,895
Connections and labour to same	30
Excavations and foundations	900
Total cost	£3,825
New steel tank, 91 ft. 6 in. diameter and 20 ft. 6 in. deep	2,300
Extras and connections repaired, &c.	200
Foundations	500
Coal-stores roof, 21 feet span and 57 feet long	130
Wilton furnace, fitted to No. 1 Cornish boiler 15 feet long.	35
Three new steel tar and liquor tanks, each 11 ft. 6 in. by 6 ft. 4 in., and 10 feet deep, and fixing	120
Workshop and fitting stores, including meter store-room, over-all dimensions 62 ft. by 18 ft., and 14 feet high	475
New meters	730
New purifiers, complete with connections, shed, &c.	2,054
Gas cookers, grillers, &c.	1,350
New galvanized building over meter, governors, exhausters, pumps, and boiler, 54 ft. by 56 ft., and 10 feet high, raised part over meter 18 feet high	411
New mains and services	1,470
Total.	£13,600

In April, 1904, having reduced the adverse balance of £1469 for 1902 to £328, the gradual reconstruction of the carbonizing plant was commenced, and this had been going on up to the present date; £1000 having been spent out of revenue under this head. This summer they had completed the erection of tar towers and tar and liquor mains, and converting the old continuous hydraulic mains into sectional mains—one section to each bed; and the arrangements were such that the seal on each bed could be controlled separately. Considerable difficulty and danger had been experienced in former years by the hydraulic main having got out of level by subsidence. Formerly, each time that a bed of retorts was let down, galvanized 5-inch plugs had to be inserted in the dip-pipes to prevent any loss of gas or inrush of air.

At this stage, the President said he thought the members would have had enough of the works; and by way of closing his address he would like to give them his experience in hiring and fixing gas-cookers. His attention was drawn to the question of hiring cookers in March, 1903, when they had 246 cookers on hire and 46 in stock. The amount received for cooker hire for the year ending March 31, 1903, was £96 16s., and the money spent in fixing and refixing was £115 3s. 5d. In April, 1903, a show-room was opened in the centre of the town for six months, in preference to an exhibition for a week, as formerly held annually; and the district was thoroughly canvassed. Mr. Ginman said he managed to get rid of all his stock of cookers, and also obtained customers for 30 new ones; and at the time he was satisfied with the result. But he was rather chagrined to find that as winter approached cookers were being returned freely; so much so that on March 31, 1904, he had 239 cookers in use and 83 in stock. The amount received for the hire of cookers for the year ending March 31, 1904, was £114; and the money spent for the same period in fixing and refixing was £53 8s. 3d. Taking an average figure for the years ending 1902-3-4, he found they were getting for the hire of cookers an average of £90 per annum, and paying £72 per annum for fixing and refixing cookers. He came to the conclusion that some change was necessary; and on May 3, 1904, he advised his Committee to abolish the hire of cookers, and make a charge of 10s. each towards the cost of fixing. This was adopted with a view to popularizing the use of gas for cooking purposes and increasing the consumption. On March 31, 1905, they had 253 cookers on loan—a gain of 14 only—and 69 in stock. This he felt was not satisfactory, and left room for improvement, as they needed an increased consumption, because they were losing half a million consumption for street lighting, and experiencing a reduced consumption by incandescent lighting. They were not at that time in a position to effect a general reduction in the price of gas all round, as they had still £190 adverse balance against them. It was, however, felt that the price of gas at 3s. 4d. per 1000 cubic feet net was too high in comparison with the cost of cooking by coal; and his Committee decided unanimously to allow a discount of 10d. per 1000 feet on gas used for cooking, heating, and motive power purposes—making the price 2s. 11d. per 1000 feet net. Gas used for lighting was 3s. 4d. per 1000 cubic feet net, with a discount meter fixed on to the back of each cooker. This commenced on July 1, 1905. Where a cooker was in use with a slot meter, they allowed 25 feet per 1d. as an all-round price.

After twelve months' experience, which they completed on June 30 this year, they now had 206 cookers fixed with discount meters and 100 coupled to slot meters. The average consumption per cooker per annum worked out at 6600 cubic feet. This could hardly be considered enough; but it would rectify itself in time, when he told them that 43 cookers in use did not take 3000 cubic feet each per annum; and as applications came in for the use of cookers, they should take those out which were only consuming between 500 and 3000 cubic feet per annum. The discount meter enabled them to check the consumption of each stove. It seemed a popular idea nowadays to have free cookers entirely, with no charge for fixing and no hire, in the belief that it was practically a summer consumption; and a considerable amount of capital had been, and was still being, spent with little or no direct check upon its earning capabilities. So far, he had no reason to regret the step which they had taken, as it had put a stop to further capital expenditure until such times as the business paid.

It would no doubt interest them to see the relation which one quarter's consumption on cookers bore to another in the town; and here he would like to say that each individual manager would deal with his own circumstances as they arose. It did not follow that the experience at Tyldesley was universal. The quarterly consumptions of gas by cookers were: September, 379,000 cubic feet; December, 283,300 cubic feet; March, 271,400 cubic feet; and June, 319,600 cubic feet. The average cost of these cookers had run out at £4 each. Whenever an extension of the business was decided upon, the class of cooker chosen would be similar to the one that was supplied and fixed entirely free at Oldham and other places—a 14-inch packed oven, with three burners on top, costing about £2 each. The future capital outlay would therefore be one-half of the present amount.

Having given some particulars in regard to the Water Department, the President, in conclusion, thanked the members sincerely for giving him their close attention to what he thought had been to some of them a rather long and perhaps weary address.

A smoking concert followed, in which many members took part; and the meeting then closed.

In the list of new King's Counsel whose appointment has recently received the approval of His Majesty, we notice the names of Mr. Corrie Grant, Mr. E. F. Vesey Knox, Mr. H. A. Rigg, Mr. E. J. Talbot, and Mr. A. J. Walter—all of whom have been closely connected with cases reported in the "JOURNAL."

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Opening of the New Session.

The first Meeting of the Association for the present session was held on Friday, in the Marlborough Room of the Regent Street Polytechnic. The chair was occupied by the President, Mr. W. Upton; and there was a good attendance—the members present numbering about thirty.

Prizes for Readers of Papers.

The first business consisted of the selection of the two best papers read during last session, for the purpose of awarding prizes to the authors. As the result of the ballot, it was announced that eleven votes were cast for Mr. W. A. Barnett's paper on "Gas-Exhausters," which was noticed in the "Journal" for Feb. 27 last (p. 579), and nine for Mr. E. E. Grimwood's contribution on "The Measurement of Artificial Illumination," an abstract of which was published in our issue of Oct. 31, 1905 (p. 313). To these gentlemen, therefore, were awarded the first and second prizes respectively.

President's Address.

Mr. Upton then delivered a brief address, in which he dealt more with what he called "thoughts ahead" than things in the present. With reference to carbonizing, he expressed the opinion that the present practice appeared to be in the direction of through settings of horizontals, regenerator firing, mechanical charging, and discharging by means of a ram. Which of the three systems—horizontal, inclined, or vertical—would finally survive, would depend to a very great degree indeed upon the matter of cost of gas made; but the deciding factor as to what kind of plant would be the gas maker of the future, would be the sort of gas circumstances would call upon them to manufacture. Therefore they would see that the true centre of gravity of the business had been, or was in the process of being, shifted from the retort-house—the "be-all and end-all" of the old-time manager—to the consumer. This was the day of transition in many businesses; but he did not think that any had undergone such an entire revolution as their own in its chief point of view. This was a fact which they should seriously consider; for while it was right that the mysteries of carbonization should be thoroughly studied, it must be remembered that, looking at the business as a whole, this process was only a means to an end.

Having, he remarked, thus seen that their vision must extend beyond the walls of the works, they might examine for a moment that which had given rise to this transference of view. The economic conditions of the present period had called, not so much for a reduction in candle power *per se*, as for the cessation of the cost of artificial enrichment over and above what it was possible to obtain under normal conditions—with, of course, a consequent reduction in price to the consumer. The atmospheric burner and the gas-engine had militated against a continuance of the old standard; and the conditions which faced them now were connected with the only other standard which could be applied—namely, the calorific. It would, he thought, be interesting to know what were the records (if any) that were being generally kept as to what it was found expedient or possible to work to on this question of heat content. From what he had been able to gather, he was afraid that too little was being done in the direction of experimenting; and when the matter was some day brought suddenly forward, a standard might, unless they had prepared for the future, be imposed that would prove detrimental to all concerned to work to. He knew of a company who only by the greatest exertion managed to defeat a proposal to impose a calorific standard on their gas that would have been burdensome both to themselves and to the consumers—who in the end had to pay the bill.

By all means, he said, let them be perfectly acquainted with the processes of production; but it was to his mind far more important to give a watchful eye and a thoughtful mind to the commercial conditions, which were rapidly changing from year to year. They had read a great deal of late about the advisability or otherwise of catering for the power consumer; but if the gas manager was content with his lighting business, he should express no surprise if the electricity people gladly accepted the power portion. To his mind such a policy was very narrow; and he preferred the spirit of the Company who had lately applied for, and had been granted, authority to supply power gas. The present make of illuminating gas, generally speaking, was handicapped by its cost and its large hydrogen content; and if it was decided to enter the "power" field, they must seriously consider whether it was not possible to evolve a more efficient method of conversion from the solid to the gaseous. A process that dealt with only 15 per cent. of its raw material, was fundamentally inefficient. Other questions which the President mentioned as requiring attention were the carrying capacity of mains—or the capacity that mains might be made to carry—the improvements that were undoubtedly to be effected in the incandescent burner and mantle, and also in cookers and fires, and the introduction of present-day methods of handling the business on the commercial side. He asked the members sometimes at least to let their thoughts travel ahead of their regular tasks, and dwell upon the larger problems that faced the industry, in order that, when the opportunity came, they might be able to deal with the matters confronting them in an intelligent and logical manner. "More and more," he said, "in our time will mere mechanical work be thought less of; the future unquestionably belongs to the thinker."

On the proposition of Mr. W. Grafton, seconded by Mr. H. Rothwell, a hearty vote of thanks was accorded to Mr. Upton for his address.

A Paper by Mr. Grafton.

Mr. Grafton then read a paper entitled "Thoughts and Realities, with other Matters affecting the Supply of Gas," the object of which he said was to excite in his hearers an interest in general things, however apparently simple. In urging them to try their utmost to further the calling they had chosen as a livelihood, he pointed out that the gas profession was by no means at a standstill, and daily they were surrounded by difficulties, all of which might be overcome by diligent application and study. Of course, this often meant self-sacrifice; but some lasting good accrued from perseverance.

In the course of his remarks, the author referred to the advantages of gaseous over solid fuel. There was, he said, economy in the perfect control of the heat, apart altogether from calorific intensity, because of the ready adjustment of gas to requirements, by simply turning on the tap more or less, or entirely off. With solid fuel this was not possible; the fire must burn out, and so the expense of domestic work could not be restrained immediately on completion of the task performed. Labour had to be undertaken in the way of removing ashes and cleaning up the grate, not to mention other things which specially applied to domestic cooking and heating. With gas, the turning of the tap put an end for the time being to all expense, heat, and labour. If gas was more expensive than coal, this was the result of wastefulness—by allowing it to burn to no purpose, as was the case (say) after removing a boiling-kettle. When, however, all reasonable care was taken (amounting to not more than one-quarter that bestowed on electrical energy), gas bills would come to about one-fifth the cost of cooking or heating by electricity; and they had in addition efficient ventilation, which was a thing not to be despised. The actual cost of gas per head, of course, depended upon the price, the number of persons in the family and their requirements, and the kind of gas supplied; but taken in a general way, when it was used for all purposes in the house, and the price was 2s. 6d. per 1000 feet, the figure would be from 0·4d. to 2d. per head per day in a family numbering five persons. Their requirements therefore represented from 24,000 to 120,000 feet per annum. One or two more in the family would have but little effect on this calculation. In the case of a prepayment installation, a consumer might receive anything from 20 to 40 feet for a penny; but the quantity used would naturally be in favour of the cheaper gas. In some cases it had been found necessary to charge a small rent on the meter and fittings if less than 5000 feet was consumed in a year; but if this quantity was burnt, the money realized, on the basis of 20 or 40 feet for a penny, would be only 20s. 10d. or 10s. 5d. per annum, which would be a by no means sufficient return to pay adequate interest on the capital expended, independent altogether of maintenance. Cases like these he hoped were rare, and it was only fair to put a rent on such slot-fittings; but he believed that no consumer having 30 feet for a penny would consume less than from 30s. to 35s. worth of gas per year. Some companies required not less than 1s. 6d. worth of gas to be used per week to make the slot system pay.

Passing over such points of interest as the heating value of gas, its reliability, cleanliness, and convenience, and gas-engines, Mr. Grafton turned his attention to pressure and its dependencies, which to his mind were not half enough thought about, but which were of the greatest importance in securing an efficient supply. He had occasionally heard that 2 inches pressure was ample, and recently noticed that 6-10ths was stated to be the best for incandescent gas-burners; but cookers were evidently not taken into account when giving this figure. It was a mistake to suppose that one must have a large service to get a full supply of gas. He had carefully gone into the matter, and found that a full supply could be obtained on a cooker by a $\frac{3}{5}$-inch service from the meter, provided the pressure was 4 inches or more. There was sufficient gas, and to spare; and there was an absence of the smell of burnt gas. Incandescent burners, whether upright or inverted, would emit a more constant light under an even head of gas than would be the case if the pressure were variable. The pressure should be not less than 4 inches. Should the house be situated near the works, and there be 6 inches pressure, they could check the main-tap on the inlet of the meter; and if this was done properly, there would be no waste, and faulty lights (often put down to bad gas) would not occur. He knew of a locality where great inconvenience was experienced for two or three days recently through there being only 12-10ths pressure. The gas was good, but the pressure was bad; and in consequence the lights indicated poor gas. Dodging about with the pressure must be avoided, because it shortened the life of mantles, and gave widespread dissatisfaction to consumers.

Turning to the question of maintenance, the author remarked that the men engaged on this work were the best suited to give the necessary information on the uses of gas and its advantages as a fuel—points which should be strongly put forward when canvassing. Printed information could also be given, with prices

plainly marked. Maintenance for a period of less than one year was undesirable alike to the company and the consumer. Careful notes should be kept, and all goods booked to the job or consumer—which meant a separate account for each one. The advantages of this were that the quarterly, half-yearly, or annual totals served two purposes—firstly, to check stock, and, secondly, to show the cost of maintaining any particular installation. A maintenance system should be run to just pay for the trouble entailed; the chief object being to retain customers.

After remarking that competition compelled attention to the different phases of the industry, and to the consumption of gas especially, Mr. Grafton stated that the Association had been approached with a view to starting classes in "Lighting," from a distinctly commercial standpoint; but whether anything would come of it, he did not know. One thing, however, he was certain of—that if the young men in daily touch with the householder or consumer would only be more painstaking and observant, many of the troubles occurring would soon disappear, and less expense follow. It was a question of forcing the situation without undue competition with the fitting trade. The gas man should know all about lighting and heating from a practical standpoint, and be able to demonstrate to a consumer in the house the proper and improper use of the burners, whether for lighting or heating. Every effort should be made to reduce the present somewhat high mantle consumption. A well-lighted room meant comfort; but then it must be done more economically. Concluding some remarks on making homes cosy and attractive, he said that, for heating, what was needed was a perfectly genial and even temperature; and this could be obtained without "the look of the thing"—an open fire. It could be secured, for instance, by the use of the gas-radiator—a heater complete in itself, which could be placed anywhere in the house without being unsightly.

Discussion.

The reading of the paper was followed by a lengthy discussion, which was opened by the President, who said that one of the chief points was the stress laid on the value of the distribution department. In these days of competition, they must look to the consumer end of the business, if they wanted to keep it. It might be very satisfactory to put the gas into the holder at a certain figure; but if the economies which had been effected at that end were to be sacrificed at the business end for want of proper attention, there was nothing in it. They must know how to push their commodity, and make it evident to the consumer that it was a good article and worth what was asked for it. The more one looked at the question, the greater did the importance of the commercial end become. Mr. Grafton had touched on one particularly serious matter—that was, the regulation of the pressure. His (the speaker's) pressure fluctuated between 1½ and 8½ inches; and at times this was anything but pleasant. There were complaints; and as in some parts of the district there was electricity, people might turn over to that. He fully endorsed what had been said about regulating pressure. If later on it should be necessary to still further increase the pressure, so as to get more gas through the mains, it seemed to him that they would have to go into the question of governors. In America, where high pressures were employed, governors were fixed in consumers' houses. He thought it was worth considering here whether it would be well to supply governors as well as meters.

In the course of a comprehensive speech, Mr. F. Ainsworth remarked that he did not think they would agree with everything Mr. Grafton had said. He (the speaker) firmly believed that the gas-cooker had come to stay, and he did not think the time was far distant when every builder would either fix them, or make facilities for them, in all houses put up. There was no question that if a gas-cooker was used as it ought to be, it was the cheapest means of cooking in a household; and it was making greater headway than any other means of using gas in existence at present. He did not know whether Mr. Grafton would recommend them to put in ⅜-inch pipe to cookers; but he did not think so. Such a pipe was not large enough; for an ordinary gas-cooker would consume, if the whole of the burners were going, from 60 to 90 cubic feet, or even more. In a paper which he (the speaker) read a short time ago, he advocated the putting in of nothing less than ½-inch piping. A small cooker might be put in for (say) three persons; and perhaps in a month the tenants would be gone. A larger family might take their place, and a bigger cooker would be required; and this would cause trouble if a very small pipe was put in at first. If gas was not cheaper than coal to cook with, it was owing to carelessness. When people complained to him of their maids, he always replied that if a servant was careless with gas she would be the same with coal. He did not believe any of them in the distribution department would think of 6-10ths pressure; but he had not been an advocate of very high pressures. He stated in the paper he had already referred to that, in his opinion, the best results were obtained at from 1½ to 2 inches. Since then his experience had been that to do without the smells which people complained of, and to secure the best results from gas-fires, from 10-10ths to 12-10ths pressure was required—he did not mean at the tap, but, when the fire was burning, between the tap and the fire. He found that using a 10-inch fire at this pressure, one could get a splendid incandescent fire with 20 feet of gas; and if this was the case, he did not see why fires should not become much more popular than was the case at present. In his district the matter had been taken up seriously; and twelve months ago they commenced to loan out fires. He believed that before very long the whole of the troubles due to excessive pressure would be overcome, and that it would be possible without difficulty to work at almost any pressure with gas-fires.

Among the other speakers was Mr. J. Hewitt, who referred to smells from gas-cookers, and said that in most cases the burners were not properly adjusted. It seemed to him a pity that either the inspector or the man who fitted a stove for a consumer did not pay more attention to this matter. Stoves were made in various parts of the country where there were, of course, no facilities for testing them for the different qualities of gas that might be used in them. Consequently, it was no good doing it there. Those who fitted stoves should see them alight, and ascertain that the flame was a proper one. His own feeling was that a good many of the burners were a little high up—they were rather near the platform on which the vessel was intended to be placed—and thus complications were apt to ensue. Mr. Rothwell also was of opinion that with cookers a good deal depended upon the local gas supply, and that therefore it was impossible to turn them out from the makers' works to meet the requirements of individual districts. As far as his knowledge went, they tested them for about 1½ inches at the works; whereas in some places the pressure was 1 inch, and in others 2 inches. The greater part of the smell and offensiveness of a gas-cooker could be obviated. Either too much gas was being used, which could be controlled by the main-cock, or a dirty, cold, or damp vessel was being employed. He would have liked to hear a little more about gas-fires, which, in spite of the thousands on the market, were only beginning to be appreciated as they ought. If only architects and builders could be induced to make the fire-places suitable for gas-fires, and give the required ventilation, all stuffiness would be done away with. In several blocks of mansions now this was being done; and ⅜-inch pipe was being put in for fires—not for cookers. Mr. F. Ainsworth inquired whether in the case of these mansions it had been arranged to put into the flues a special damper; because, if not, he thought there might be trouble. Mr. D. Smithers replied that there was nothing in the flues to prevent down-draught. This would have to be left to the gas-fitters to attend to. Mr. Hewitt remarked that one member had said the smell of gas-cookers could be obviated by regulating the gas supply at the main-cock. He himself considered that where the pressure was required was at the point of emission—in other words, the nipple. The much better way would be to adjust the nipple itself. In this case they would have the pressure right up to the nipple, and would be able to draw in the necessary quantity of air. Mr. S. A. Carpenter agreed that the pressure should be regulated at the point of emission; and he drew attention to the need for cleanliness in connection with gas-cookers. With gas-fires, no doubt a low pressure gave the best results. Economy and a quiet fire were secured; and these were the two most important things with such appliances. As to the rates charged for stoves, he would like to know how these compared with the cost of the stove. Mr. Rothwell replied that in some districts from 7½ to 8 years' rent covered the value of the stove.

It was pointed out by Mr. W. B. Farquhar that want of pressure might arise from various reasons. The cause might be at the works, in a service main, or in the house-service. Suppose the works were sending out the gas at 3 inches pressure, and they received complaint of a deficiency of pressure in a certain place. This was not to say that the engineer must put on another inch. He should have a house-to-house visitation in that part, because it might happen that another district had grown and robbed this particular main. Then all localities were not on the same level, and houses at the top of a hill robbed the service. It was very important to keep up the pressure; and he thought to do this they wanted—particularly in a large town—to map out the area into districts, because if they had an insufficient pressure in one district, and put on an extra inch or two at the works, there might be an excessive pressure in another part. This would be obviated by district governors. Mr. D. J. Winshaw said he found that maintenance was not acceptable to the general householder. The people thought they could do the work themselves cheaper than the average price charged by companies. He cited a cash maintenance system which had been started. That was to say, a man went round from time to time to private houses, cleaning the burners and providing mantles; and on leaving, he was paid the sum charged, for which he gave a receipt. In this way it came cheaper to householders, whose burners were better maintained; and it was a good thing for the gas company, though, of course, it did not pay so well as weekly maintenance. One or two other members having asked questions,

Mr. Grafton proceeded to reply to the discussion. He said that, with regard to high pressures, he did not believe in governors, because they were costly. The whole thing could be done with taps. A man was not going to run away from gas, and take to electricity, because of a little variation in pressure. As to Mr. Ainsworth's remarks, that gentleman, of course, had a specially good district. Because a ½-inch service was right for Ilford, it did not follow that it was right for all places. A ⅜-inch pipe was fitted to his cooker—a Parkinson "Crown"—and it did all the work admirably. When he had a ¾-inch service, equal to the supply on the meter, he had smells, which showed that the cooker could not deal with the quantity of gas turned on to it. If Mr. Ainsworth was able to get from 60 to 90 feet per hour with all his consumers,

he was particularly favoured. Careless people should be educated, so as to prevent dissatisfaction. From 10-10ths to 12-10ths was a most ridiculous pressure; but it was really a question of the kind of gas that was used. Again as to the ⅝-inch pipe, if they took a Bray No. 5 burner, which would consume comfortably 5 cubic feet of gas per hour, and compared the passage with a ⅝-inch pipe, they would see that the latter would supply a lot of Bray burners. Regarding dampers to chimneys, he did not think these would answer. They might be shut when they should be open; and this would be inconvenient. As to checking the main-tap, this depended on the kind of gas they had. With coal gas, they could do what they liked; but this was not the case with 50 per cent. of carburetted water gas. The charge for maintenance in some places was 9d. per burner, and in others 1s. 6d. This was costly; and it was quite likely it did not meet with the appreciation it ought to. As to public lighting, the average number of mantles used per burner varied considerably. It might be four, five, or even nine for similar areas; and so it seemed that local circumstances had to be taken into account. If the pressure was constant, the mantle would be kept filled; and therefore there would not be that contraction and expansion which tended to wear the mantle out. In some private houses the number of mantles required per burner was 1½, and in others 4. Perhaps a fair average would be from 2 to 2½. In his own house, he had had mantles in use for over two years; and this was because he knew the value of 4 inches pressure, instead of 12-10ths.

On the motion of the President, seconded by Mr. Ainsworth, a cordial vote of thanks was passed to Mr. Grafton for his paper.

New Honorary Patrons.

It was announced that Mr. A. F. Browne, of the South Metropolitan Gas Company, and Mr. F. W. Goodenough, of the Gaslight and Coke Company, had consented to become Honorary Patrons of the Association.

Prospective Visits.

Arrangements are being made for the members of the Association to visit various places of interest during the present session. These will include a visit to Messrs. Glover and Main's Gothic Works, at Edmonton, on the 1st prox., and to the Gaslight and Coke Company's Kensington Show-Rooms on the 24th prox.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Visit to the Dundee Corporation Gas-Works.

The members of the Scottish Junior Gas Association to the number of over forty, paid a visit on Saturday afternoon to the Dundee Corporation Gas-Works. Arriving as they did at different times, each party was met at the gate of the works, and taken round at once; the various guides being Mr. A. Morton Fyffe, the Assistant-Manager; Mr. T. Harper, mechanical engineer; and Mr. W. Mitchell, general foreman.

The works, which were largely reconstructed two or three years ago, are ample for present requirements, and there is plenty of room for extensions, although it would be difficult to extend them to anything like double their capacity without considerable interference with existing plant, belonging to the old order, which was presumably left where it is on the score of economy, as well as on account of the fact that the works being hemmed in on all sides by thoroughfares, it was not possible to get sufficient land to allow of further large extension. There is an elaborate network of railways, serving every corner of the works—both on the level and elevated. A spacious retort-house, containing a bench in two sections, with 296 retorts set back-to-back in each, and coal-stores on both sides, occupies the eastern side of the works. There are 24 ovens of twelve retorts, and 26 ovens of eleven retorts; the producing power being over 4 million cubic feet of gas per 24 hours. They are built on the regenerative principle, and are charged and discharged by Arrol-Foulis machines, worked by hydraulic power. There are four charging and four drawing machines; and for each charging machine there is coal breaking and elevating plant, with a conveyor across (above the retort-bench), so that, in the event of a breaker or elevator on one side being put out of action, coal could be fetched from the other side till repairs were executed. There are eight hydraulic lifting rams, which deliver the coal either into the breakers or into store. The condensers, of annular form, 30 feet high, with outside tubes of 42 inches diameter, are capable of dealing with over 5 million cubic feet of gas per 24 hours. A tar-well beneath is of a capacity of over 120,000 gallons. An overhead malleable iron tank, 40 feet diameter by 12 feet deep, separates the tar from the ammoniacal liquor. From this the tar is run into tank waggons for removal. The ammoniacal liquor gravitates through a filter to an underground tank, from which it is pumped to the chemical works. There are three sets of exhausters, steam driven, with a combined capacity of 660,000 cubic feet of gas per hour. Four Babcock and Wilcox water-tube boilers, each of about 275-horse power, provide steam for the whole works, except the carburetted water-gas plant. There are two washer-scrubbers of the Holmes type—one capable of dealing with 3 million and the other with 2 million cubic feet of gas per 24 hours. The maximum daily output of gas is, roughly, 3⅜ million cubic feet. The purifying shed is in two sections. There are five sets of purifier boxes, or twenty in all. Three sets measure 30 feet by 20 feet, with four tiers of grids; and two sets measure 20 feet by 20 feet, also with four tiers of grids—the purifying capacity being over 4 million cubic feet of gas per day. Both lime and oxide of iron are used. The purifier covers are lifted by a travelling apparatus, which works all the purifiers. There are two station meters, one with a capacity to pass 150,000 cubic feet of gas per hour, and the other 50,000 cubic feet. There are five gasholders on the works, and one at Lochie, with a collective capacity of 2¾ million cubic feet. The gas may be enriched either by carburetted water gas or by benzol, for which there is the plant of Messrs. Humphreys and Glasgow and the Maxim patent carburetter. The connections are so arranged that the benzol enrichment may be introduced either at the outlet of the station-meter or at the inlet of the station governor, or at both, as desired. The carburetted water gas is sent through one of the larger sets of purifiers, and the smaller station meter, and is mixed with the coal gas in the holder. Coke is taken from the retort-house in side-tipping waggons, drawn by small locomotives, to the coke-gantry, where it is tipped over and quenched; and it is then lifted by a travelling crane with patent grab, is riddled and filled into waggons or carts, or stored. There is an efficient sulphate plant, a laboratory with complete experimental gas plant, a large range of workshops, and ample stores.

After having seen the works, the company were entertained to tea in a restaurant in the city.

Mr. A. Morton Fyffe, who presided in the unavoidable absence of Mr. A. Yuill, the Engineer and Manager, extended a hearty welcome to the visitors. He considered the visits to works were of more benefit to members than the reading of papers.

The President (Mr. W. Brown, of Lasswade) desired the Chairman to convey to the Dundee Gas Commissioners, through Mr. Yuill, their thanks for the privilege of inspecting the gas-works. He was sure they had all been impressed with what they had seen, with the labour-saving apparatus, and the general up-to-date character of the works. Their united thanks were also due to Mr. Fyffe and the others who had received them.

Mr. W. Mitchell returned thanks.

Mr. J. R. Moyes (the Hon. Secretary) expressed the pleasure he had had in meeting members from a distance, three of whom—Messrs. Hadden, Mackenzie, and Auld—had come all the way from Aberdeen.

The members afterwards spent an hour or two in the Gas Exhibition now being held in the Drill Hall.

SOUTH-EAST OF IRELAND GAS ASSOCIATION.

The Annual Meeting of the Association was held at Waterford last Wednesday—Mr. G. Lennon, of Dungarvon, the Vice-President, in the chair.

The Committee submitted their report, in which they directed the attention of the members to the sound financial position of the Association; the balance in hand being £9 0s. 2d. The receipts for the twelvemonth were £4 15s.; and expenditure was £5 11s. 1d—£4 10s. of the latter being for library books. The Committee were unable to recommend the award this year of a prize of one guinea in books (presented annually by a member), and suggested that the Secretary (Mr. J. G. Tooms, of Waterford) should issue a circular setting forth the terms under which this prize will be awarded each year, and giving the latest date for the receipt of any applications.* The Committee said it was expected that the members of the Association would bring this matter under the notice of their employees, and endeavour to stimulate more interest in technical work. The Committee concluded by expressing their pleasure in noticing that the Association continued to fulfil the purpose for which it was formed.

The report having been adopted, Mr. H. Hawkins (Limerick) was admitted a member of the Association; and the following officers were elected for the ensuing year:

President.—Mr. G. Lennon, of Dungarvon.
Vice-President.—Mr. W. W. Tooms, of Fermoy.
Hon. Sec. and Treasurer.—Mr. J. G. Tooms, of Waterford.
Committee.—Messrs. G. W. Norman and R. Bruce Anderson.
Auditor.—Mr. T. Hornby, of Mallow.

In the unavoidable absence, through illness, of two members who had promised to read papers, a discussion took place on the question of apprentices to gas-fitting; the points brought forward being whether or not they should be indentured, and the best means of raising the tone of the boys so employed. In connection with this subject, it was remarked that the Waterford Gas Company had agreed to take at least two of the best boys each year from the day trades preparatory class of the Technical School recently opened in Waterford, and indenturing them after a probationary period; their wages to commence at from 6s. to 8s. per week according to whether they had served one or two years in the day school, and the boys to receive 2s. per week increase each year. It would, however, be stipulated in the indentures that the boys should attend evening technical classes.

* In virtue of this instruction, the Secretary has issued the notification which appears in our advertisement columns to-day.—Ed. J.G.L.

REMOVAL OF NAPHTHALENE FROM COAL GAS.

By Alfred H. White and Joel M. Barnes.

[Paper presented at the Meeting of the Michigan Gas Association.]

(*Continued from p.* 183.)

Comparison of Results at Ann Arbor, Saginaw, and Detroit.—The naphthalene removed from the gas must be absorbed by the tar. Why did not the tar absorb it in the main? The only explanation can be that it was not given a chance. In our machine, the speed of the gas is very materially slackened, and the gas is stirred so that equilibrium will be more completely reached than in the sluggish currents of the main. If this explanation is correct, we should expect the same sort of result—differing only in degree—if the speed of the centrifugal were cut down till it became a mere mixing chamber through which the gas passed at the same rate, leaving the tar to be removed by the asbestos filter. Experiments to test this were made at Saginaw, where, after two tests (Nos. 29 and 30 of Table II., *ante*, p. 182) had been made in the usual way, two more (Nos. 31 and 32) were made with the centrifugal running very slowly. The results on the inlet do not differ very materially among the four tests. At the outlet, the tests with the centrifugal running fast and throwing out 80 per cent. of the non-volatile tar, show 0·011 and 0·020 gramme of naphthalene per cubic foot of gas; while the tests with the machine running very slowly, and separating only 41 per cent. of the tar, show 0·016 and 0·024 gramme of naphthalene after the remainder of the suspended tar had been filtered out with asbestos. This result is only slightly in favour of the high-speed separator. Apparently any machine that will agitate the gas and remove the tar will answer the same purpose. Inasmuch as this is exactly the function of the Pelouze and Audouin condenser, it will be of interest to compare the results at the outlets of the centrifugal and of the Pelouze. Twelve tests at the three works mentioned are available for this comparison. The data are as follows:—

Table IIIa.

	Temperature. Deg. Fahr.	Grammes of Naphthalene per Cubic Foot of Gas. At Outlet of Centrifugal.	At Outlet of P. and A.
Ann Arbor	106	·011	·011
	116	·013	·021
	115	·017	·022
	123	·028	·030
Detroit	136	·029	·032
	117	·018	·011
	116	·016	·029
	138	·061	·058
Saginaw	142	·011	·020
	136	·020	·019
	138	·016	·028
	140	·024	·018
Average		·021	·024

This shows a slight advantage for the centrifugal, which, however, is too small to be considered decisive, as it is sometimes with one and sometimes with another. Our experimental centrifugal should have given the more regular results, because the gas was drawn through it at a uniform rate, while the Pelouze had sometimes to accommodate itself to variations of over 30 per cent. in the rate of flow within half-an-hour at the time when the old

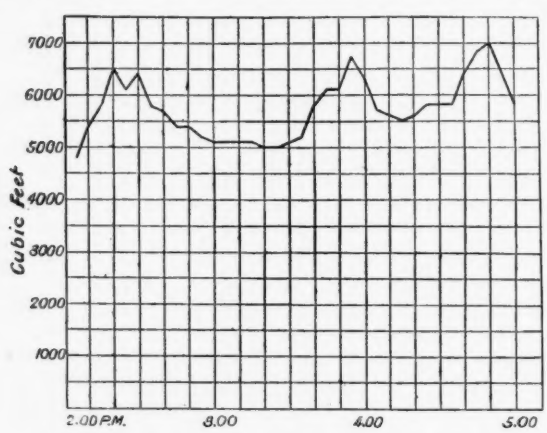


Diagram I.—Variation of Volume of Gas Made, Plotted at Five-Minute Intervals.

charges were being drawn and fresh ones put in. This is shown very graphically by the mountainous character of the curve in the accompanying diagram. The test was made on Nov. 7, 1905, on coal gas made in the new plant. The 2 p.m. charge was put in at 2.01 p.m.; the 3.30 p.m. charge, at 3.32 p.m.; the 4.30 p.m. charge, at 4.33 p.m.

The tests at Ann Arbor, as before noted, show a uniform increase in the amount of naphthalene in the outlet gas as the temperature increases. Those at Detroit (Table III, *ante*, p. 182) do the same, with the exception of the first, where, on account of trouble with the machine, the duration of the test was 30 minutes instead of 20. This test shows a larger naphthalene removal than the duplicate test No. 28 at a corresponding high temperature, and suggests that in the other tests the gas was being too rapidly separated from the tar to obtain the best results. The results at Saginaw belong in a class by themselves, because water gas was being mixed with the coal gas before the exhauster. This water gas was about one-half the volume of the coal gas, but was being added at a constant rate; while the volume of the coal gas fluctuated. The naphthalene in the outlet gas is lower than for a corresponding temperature at the other works, due probably to the mixed water gas.

In comparing the results of this year's tests at the Pelouze and Audouin condenser with those of last year, it is to be noted that almost all the tests this year are made at decidedly higher temperatures. This is partly due to the time of year at which the tests were made, and partly to increased production of gas with an unchanged condensing system. Our tests this year show uniformly larger amounts of naphthalene in the gas; and our experiments, made by purposely varying the temperatures at the inlet to the Pelouze, lead us to ascribe this increase to these higher temperatures, to which should be added the correlated influence of the effect of increased production in lessening the time during which the gas remains in the condensing system.

The question now arises: What would have been the effect had the gas been allowed to cool to a lower temperature before removing the tar? To answer this question, we have only the results of a number of tests at the Ann Arbor Works, where the gas was allowed to cool somewhat in its passage through the centrifugal. In this set of tests, the pipe connecting the machine to the main was kept warm, and the lower half immersed in a water bath of the same temperature; but the top was exposed to the air of the room. Under these circumstances, the naphthalene in the gas at the outlet varied from 0·003 to 0·007 gramme per cubic foot; the average of the four tests being 0·005 gramme, which could saturate the gas at 52° Fahr. A direct comparison was made on the last test between the effect of the centrifugal machine under these conditions and the results shown by the Pelouze tar-separator, and it was found that while 0·007 gramme was passing the former under these circumstances (sufficient to saturate the gas at 57° Fahr.) 0·014 gramme was in the gas emerging from the latter, working at 115° Fahr., which is sufficient to saturate the gas at 69° Fahr.

It is apparent, from all these tests, that a Pelouze separator helps in bringing about equilibrium between the gas and the tar, and removes a considerable quantity of the suspended tar; but if operated at too high a temperature it allows an unduly large amount of naphthalene to go forward. If the gas is cooled, and sufficient contact is allowed, it is probable that practically all the naphthalene will be dissolved in the tar and removed with it. If the Pelouze separator is working at a high temperature and removing a good deal of the tar, it may be open to question whether sufficient will be left associated with the gas to dissolve out the remaining naphthalene. The lack of a suitable method of determining the light oils and other volatile constituents, as well as the naphthalene going forward as vapour, has prevented us from presenting any figures on this important point.

Effect of Change in Differential Pressure of the Pelouze and Audouin Tar-Separator.—These tests were all prompted by a discussion in which Mr. Tippy, the Superintendent of the Manufacturing Department of the Detroit City Gas Company, stated that they found it advisable, at their new plant in Detroit, to run the Pelouze separator under a very slight differential pressure—less than 0·5 inch. They purposely allowed a considerable quantity of tar to pass into the secondary condenser, as experience had taught them that if they removed it too completely at this point, they were soon troubled with naphthalene stoppages in the latter part of the condensing system. He offered to demonstrate the matter, and accordingly raised the differential pressure in the Pelouze from 0·5 inch to 2·5 inches. After five days had been allowed to give the apparatus time to adjust itself to the new conditions, we made a test of the condensing system according to the method reported a year ago. These tests were carried out in midsummer, when the inlet of the Pelouze was above 130° Fahr., and presented temperature conditions different from any previously encountered by us. The weight of tar and water coming to the separator was larger than had been previously found, to be explained undoubtedly by the higher temperature. The weights both of tar and of water leaving the Pelouze were also higher, in spite of the increased differential, as were the amounts of naphthalene in the gas.

Tests at the inlet to the box washer showed that this heavy non-volatile tar had been almost completely eliminated in the secondary and multitubular condensers, although sufficient remained to stain the asbestos somewhat; but that the suspended light oil, the quantity of which we have no satisfactory method of estimating, contained so much dissolved naphthalene that its amount was twice as great as that in the gas and tar together at the outlet of the Pelouze. This is a most remarkable result, and it might be passed over as an experimental error did not the two tests on different days give entirely concordant results. As it is, it can only be noted, but not explained.

These tests also show an important increase in naphthalene as

the gas passes the scrubbers; the gas leaving saturated at 63° Fahr. Under these circumstances, it is not strange that, almost before the result of this test had been obtained in the laboratory, the following letter was received from Mr. Tippy, showing a complete fulfilment of the prophecy made by him before commencing the test. The writers desire to place this letter on record, not only for the information it contains, but also for the cordial spirit of helpfulness which it shows, and which we are happy to say has, without exception, greeted us in all our dealings with the gas fraternity:—

Detroit, Aug. 14, 1905.

Professor Alfred White, University of Michigan, Ann Arbor (Mich.).

Dear Sir,—On July 26, 1905, we increased the differential pressure of our tar-extractors to remove most of the tar at this point. The pressures all along the line were taken each morning, and a record made of them. I will submit to you the differential pressures of the various pieces of apparatus, being the difference in pressure between their inlet and outlet at intervals of a few days between the time of starting the experiment and Aug. 7, at 4 p.m., at which time we were obliged to bye-pass a part of the apparatus on account of high pressure. Differential pressures were:

	Secondary Condenser.	Multitubular Condenser.	Washer.	Rotary Scrubber.
July 26, 4.25 p.m.	0·2 in.	0·4 in.	3·0 in.	2·9 in.
Aug. 1, 8.30 a.m.	0·1 ,,	0·9 ,,	4·7 ,,	2·3 ,,
,, 7, 8.10 a.m.	0·1 ,,	1·3 ,,	5·8 ,,	6·7 ,,
,, 7, 4.00 p.m.	0·2 ,,	2·3 ,,	9·4 ,,	8·5 ,,

After removing the stoppages, we decreased the differential pressure in the Pelouze to 0·2 inch, so as to let the light tars go forward.

The stoppage was evidently to a small extent in the multitubular condenser, but to a much larger degree in the washer and rotary scrubber, where the ammonia was liberating free naphthalene in the manner pointed out in our paper a year ago. A further explanation of the phenomenon is, however, almost impossible, because, instead of the change in differential pressure at the Pelouze being the only variable to be considered, its temperature and the amounts of tar coming to it, and passing forward from it, are also widely different from any conditions before observed by us. However, the experience of the Engineers of the Detroit Gas Company in handling their condensation system entitled their opinion to the greatest respect, and therefore some systematic work was undertaken at Ann Arbor to determine the effect of changes in differential on the Pelouze separator there. The results will not be reported here, as they were inconclusive. The disturbing factor, when finally found, was beyond our control, and is discussed in the next paragraph.

Errors in Sampling from Large Gas-Mains.—We had assumed that we could get a fair sample of the gas by inserting a sampling-tube into the main; relying upon the mixing which the gas had received a few seconds previously, while passing through the exhauster, together with the pulsations of the exhauster, to bring to our sampling-tube in the course of 20 minutes an average sample of the contents of the main. This assumption was found to be totally erroneous, as was shown by experiments here quoted. Two experiments were simultaneously made, the sampling-tube in one being extended to practically reach the centre of the 14-inch main, and in the other the tube being extended only about ¾-inch beyond the inside line of the main—just sufficient to clear the wall, and make certain that no tar could run down the side of the main and work into the tube. The time required to draw a cubic foot of gas through was 22 minutes in the first set, and 24 minutes in the set repeated later to guard against experimental error. The figures with regard to the tar and naphthalene are given below:—

TABLE IVA.

No. of Test.	Temperature P. and A. Inlet.	Non-Volatile Tar.		Naphthalene in Tar.		Naphthalene in Gas.		Naphthalene Total.	
		Inlet.	Outlet.	Inlet.	Outlet.	Inlet	Outlet.	Inlet.	Outlet.
21*	100	·182	·044	·018	·005	.011	·010	·029	·015
21	..	·458	·092	·064	·008	·009	·009	·073	·020
22*	105	·201	·044	·020	·004	·019	·017	·039	·021
22	..	·575	·059	·075	·010	·014	·012	·089	·022

* First test in each case was made at centre of main; second at edge.

These show almost three times as much suspended tar at the edge as at the centre of the main entering the Pelouze, with a smaller disagreement between the figures at the outlet. It is not believed that these figures can be due to experimental error. Experiments on the flow of water in large mains have shown that the stream in the centre of a straight pipe travels considerably faster than that at the edges. If the same relations hold true for gas travelling in large mains, it would seem natural that the solid particles should gradually be pushed into the more peaceful currents at the edge, and that the gas sampled near the edge of the pipe would contain an unduly large amount of suspended tar. This would explain our results at Ann Arbor, but would also cast doubt on the accuracy of all figures obtained by us, as there are no means of knowing how closely the samples we obtained were average ones. It is to be noted, however, that though the disagreement is large on the suspended tar, there is only a small difference in the weights of naphthalene in the gas, and that it is the naphthalene in the gas which is of greatest importance to us. The results on naphthalene are believed to be fairly reliable. The results on the amount of tar coming to as well as leaving the Pelouze are roughly comparable with one another on account of the agreement in the method of sampling employed; but they do not necessarily represent a fair average of the conditions prevailing in the gas-main.

The necessity for estimating the suspended tar and preventing drop in temperature while removing it, prevents application of the usual methods for ensuring a fair sample of gas; and no way has suggested itself of avoiding the error. On this account, we do not place very great reliance on the figures showing the amount of tar coming to the Pelouze separator. The amount leaving it is much more accurately estimated; and there should be no error of sampling at the outlet of our centrifugal separator, as the whole of the gas passed through the asbestos filter in each experiment. The error has no large effect on the reported amount of naphthalene in the gas, but it prevents any accurate estimation of the amount of suspended tar. It is possible, by careful manipulation, to get fairly comparable results; and it is not believed that the errors involved in any of those presented in this paper would nullify the conclusions drawn.

(*To be continued.*)

LARGE GAS-ENGINES.

By H. A. HUMPHREY, M.Inst.C.E., M.I.Mech.E., &c.

[A Lecture, with Lantern Slides, delivered in connection with the Engineering and Machinery Exhibition at Olympia, Oct. 11.]

In my last lecture [see *ante*, p. 110], I dealt with various types of English and Continental gas-engines of large size; but I think a few words should be said about one of the most enterprising firms of gas-engine makers in America, who have produced a type of gas-engine which they are constructing in very large units. I refer to the Snow Steam-Pump Company, of Buffalo, who first commenced to build gas-engines for the compression of natural gas obtained from the gas-wells in Pennsylvania. They make a 1000-horse power gas-engine coupled to a compressor; and they have installed two gas-engine gas-compressors of 4000-horse power each, which are used by the Hope Natural Gas Company, and have been erected at Hastings, West Virginia. After supplying quite a large number of engines for the purpose already indicated, the Company are now erecting, for the California Gas and Electric Corporation of San Francisco, three gas-engines, each of 5400 brake horse power, intended for the generation of electric current for the street railways of the city. A fourth gas-engine of the same size has recently been ordered; so that this Company will hold the unique record of having constructed in four units a total of 21,600-horse power. In addition, they have in hand an engine of 3750-horse power for supplying alternating current for street railways at Atlanta, in Georgia, and two gas-engine blowing-engines, of 3000 brake horse power each, for use in connection with blast-furnaces at the Illinois Steel-Works of Chicago, belonging to the United States Steel Corporation. These large engines are of the four-cylinder double-acting type, but differ considerably from the 1000-horse power engine, inasmuch as the recent engines have combustion chambers at the sides of the cylinders, piston-valves instead of mushroom valves, and side cranks instead of centre cranks. I have some excellent indicator cards taken from a four-cycle double-acting twin tandem 38 in. by 60 in. 4000-horse power Snow gas-engine, already mentioned, but when developing 4500-horse power. Never after this can central station engineers complain that they cannot obtain gas-engines of sufficiently large units.

In the first lecture, I brought to your notice numerous types of gas-engines; and it is important that I should now point out some of the characteristics of the different types as regards their uniformity of turning moment. Suppose that a single-cylinder double-acting steam-engine, running at a certain speed and delivering a certain power, requires a fly-wheel of a given diameter to have a weight of 10 tons to ensure sufficiently steady running for some specific purpose, then taking the different types of gas-engines all supposed to exert the same horse power at the same speed, and with the same diameter of fly-wheel, we can get an approximate idea of their uniformity of turning moment from the weight of fly-wheels which would be required to give the same degree of steady running. A single-cylinder single-acting Otto engine which has one impulse in two revolutions, or four strokes, would require a fly-wheel of 62·8 tons; but a *vis-à-vis* engine having two single-acting cylinders on the Otto cycle would require a fly-wheel of 40 tons. So also would a single-cylinder double-acting Otto cycle engine. Better than these are the two-cylinder twin engines working on the same crank angle, and the two-cylinder single-acting tandem engine, both of which require a fly-wheel of 30 tons. We still need the same weight of fly-wheel for the four-cylinder twin tandem engine working on the same crank angle. An arrangement of twin *vis-à-vis* engines, with four single-acting cylinders but working on opposite cranks, only requires a fly-wheel of 10 tons. We can get the same result in the Otto cycle double-acting engine with two cylinders arranged in tandem, which again requires a 10-ton fly-wheel—*i.e.*, the same as for the steam-engine.

Some sets of curves prepared by Herr Klönne, showing the

comparison of various types of engines, not only in connection with their turning moment, but—what is so important for all gas-engines which have to drive alternators working in parallel—the actual angular deviation from the mean speed during the one or two revolutions required to complete the cycle, demonstrated how exceedingly small is the deviation from absolute uniformity. It must be borne in mind that the cyclical variation of speed is not the same thing as the cyclical deviation. The former refers to speed variations and the latter to angular displacements resulting from the former. Cyclical variation of speed is generally used in talking about the degree of regularity required in the driving of alternators in parallel; and for ordinary industrial purposes about 1-30th of the speed in one and the same cycle is generally demanded. For electric lighting by continuous-current dynamos, it is necessary to have a degree of regularity of about 1-60th; while for running alternators in parallel the engines should possess a degree of cyclical variation of 1-150th or less. The figures are only approximate, as they depend on the number of alternations per second and other matters too complicated to enter upon at the moment. Much closer regulation is sometimes demanded; and in America, consulting engineers sometimes ask, where the load is largely an induction one, for a degree of regularity not exceeding 1-450th. Bearing these figures in mind, one will be able to appreciate the purposes for which the various types of gas-engines are most suitable.

An instrument has been devised by Dr. Horne, of Hanover, which can be driven from the crank-shaft of a gas-engine, and which shows directly the degree of speed variation on a continuous recording apparatus. It is called a "tachograph."

Other conditions being equal, the weight of a fly-wheel needed in order to give a certain degree of regularity is inversely proportional to the cube of the number of revolutions per minute. Hence, a quick-running engine requires a very much lighter fly-wheel, or, for the same weight of fly-wheel, gives a much better degree of regularity.

The cyclical variation of speed must not be confused with total variation of speed as between one revolution and another at different times. It is the function of the governor to keep the average speed uniform; and in early type engines this was roughly effected by cutting off the gas supply for a whole stroke as often as might be required to keep the speed down. This so-called "hit-and-miss" system has been abandoned for all large gas-engines. The governing is now done by varying the quantity of gas admitted at each charge; so that with a heavy load more gas goes into the cylinder at each stroke than on a light load—the balance of the cylinder volume being made up of air. This means that the total volume of explosive mixture remains approximately unchanged; while the quality of the mixture is varied to suit the working load. This results in constant compression of the mixture before explosion under all conditions, and has the great advantage that the constant compression pressures are utilized to bring the reciprocating masses to rest, and so neutralize the forces due to inertia, which would otherwise remain unbalanced. Modern large gas-engines, working with producer gas, are now able to take in and explode a charge every cycle, even when working without load.

Another system of governing is that introduced by the Westinghouse Company, and consists in throttling the mixture which remains of constant composition. In other words, there is always the same ratio of gas to air; but the quantity of the mixture varies in proportion to the working load. This is known as the quantity system of governing, and has the disadvantage that on light load it is not so economical, and, further, the compression pressure varies. It has, however, the merits of great simplicity and great sensitiveness; and the British Westinghouse Company consider that the latter good qualities outweigh the disadvantages. Other examples of quantity governing will be mentioned later on. As regards close governing, gas-engine makers are now prepared to guarantee that the governing shall be as good as with steam-engines; and I have stood by and watched a large gas-engine taking a rolling-mill load (which is the most irregular of all loads), and have hardly been able to notice any speed change on the tachometer.

I have already said much to show that the gas-engine is now in all respects a thoroughly reliable prime mover; but I will frankly admit that the early engines of large size gave very considerable trouble, and I am quite sure that, having in mind these early experiences, many central station engineers are still fighting shy of the large gas-engine. It is worth while spending a short time to consider what these early troubles were and how they have been removed.

In the first place, some of the early difficulties—such as the sticking of valves, and the scoring of cylinder liners—were due to the gas, and not to the engine. We know now that it pays handsomely to clean the gas, and to do this thoroughly. Also, we have to-day much better lubricating oils; and engines can be run for months on end without accumulating tarry deposits of charred oil on the cylinders and piston-rings. Turning, however, to the troubles in the engine itself, we may mention first the leaking of various joints. Formerly, cylinder liners and jackets were made separately with a narrow water-space between them; and allowance for the difference in contraction between the liner and the jacket had to be made. This involved both fixed and sliding joints, which were liable to give trouble when dealing with large engines. Compare a good example of a 200-horse power gas-engine as formerly designed, with its separate cylinders and jacket castings and narrow water-space, with one of the modern engines. In the latter the cylinder and jacket are all made in one casting. The joints are done away with; and, to prevent the evil effects of difference in expansion between the cylinder and the jacket, the water-space between them is made much larger.

Then, again, one formerly experienced troubles in connection with the valves and means of operating them; and this especially applies to the exhaust-valve, which had to be opened under considerable pressure, generally by means of a cam acting upon a lever. The sudden opening of these valves put a big strain on the mechanism; and the chief noise in the early large gas-engines came from the working of the exhaust-valves. In modern engines, the exhaust-valves and their seatings are now effectively water-cooled; and the valves are quietly opened at the beginning without undue strain on the mechanism, by means of rolling contact-levers or their equivalent devices. The cooling of the valves and seats prevents the scoring of the metal by the hot exhaust gases; and the quiet and easy operation of the valves does away with the noise and jar which were formerly noticeable.

Piston troubles, due to overheating, seizure in the cylinder, and the wearing of the cylinder oval by the weight of the piston continually rubbing with greater force on the bottom of the cylinder, are all done away with in the modern engine by the introduction of water-cooled pistons and the supporting of the weight of these pistons on cross-heads and slippers placed outside the cylinder, where they can be well lubricated and looked after.

Piston-rod stuffing-boxes were formerly a source of annoyance. Asbestos packing, asbestos with plumbago, and asbestos with white metal were all tried, and given up. A modern piston-rod packing, which is absolutely successful and gives no trouble whatever, consists principally of a number of rings, like small Ramsbottom piston-rings, which are split, and have a slight spring clip action on the outside of the rod, and a number of distance-pieces which hold these rings in position. The rings can slide vertically between the distance-pieces, which latter have a clearance for this purpose; but the distance-pieces never touch the rod. Following this arrangement, there is a metallic packing having a certain degree of flexibility, so that it may accommodate itself to slight movements of the rod. This latter type of packing is used in ordinary steam-engines.

The foregoing indicates only some of the more important troubles which care and skill have abolished from modern gas-engines; but, if time permitted, investigation would show that even the smallest details of gas-engines have been subjected to thorough revision. Perhaps nothing I could say is more likely to impress upon you the complete reliability of the large gas-engine, designed on modern lines, than the following statement: When recently on a tour of inspection on the Continent, I was invited, by the courtesy of Messrs. Thyssen and Co., to see their first completed 2000-horse power gas-engine standing in their shops. I also saw a large number of castings for similar-sized engines, and on inquiry I was told that they had orders for twenty-five 2000-horse power gas-engines then in hand. Now, this firm had not a single large gas-engine running; and the first 2000-horse power engine made to the new designs was the one I saw standing in their shops. You will therefore realize the confidence which has existed in those firms who placed the orders for these twenty-five engines; and it is only because the gas-engine problem is now so thoroughly well solved that it would be possible to guarantee the satisfactory working of these engines without ever having had one running.

Before I bring this lecture to an end, I should like to say a few words about the future of the gas-engine. When on the Continent two years ago, I was able to see, during a fortnight's tour, 30,000-horse power of gas-engines. This year, with the same amount of time at my disposal, I was able to see 100,000-horse power of gas-engines. Not only has the number and size of unit increased, but the length of operation of the engines without cleaning, and the freedom from breakdowns and stoppages, has greatly improved even during these last two years. The managers and foremen who are responsible for the running of thousands of horse power of gas-engines, now no longer look tired or worried—in fact, they seem to have an easier time than those who are in charge of steam-engine stations. This is not to be wondered at, because the absence of high-pressure steam from a central station means a very great deal. A network of such high-pressure steam-pipes is always a source of responsibility; whereas gas-pipes, conveying cooled gas under very slight pressure, is child's play in comparison. Then, again, how easy it is to start up a large gas-engine in a sudden emergency. One simply turns on the high-pressure air supply; and in two minutes the engine is ready to take its share of load. Indeed, within two minutes from rest, I have had a large gas-engine driving a dynamo running in parallel with other generators.

One works alone in Germany has 35,000-horse power of gas-engines running; and also in that country two central stations are being started which are to employ gas-engines for generating electric energy for a variety of purposes, including lighting and tramway work. These stations are expected, in a few years, to have 50,000-horse power of gas-engines each. That the gas-producer designed to supply the gas-engine with the cheapest possible gaseous fuel of uniform composition is also ready to meet the demand of large stations and units will be seen from an illustration of a Mond gas plant at work in South Staffordshire, capable

of supplying gas for 15,000-horse power. It has been designed with a view of adding three more units, making a total of 60,000-horse power when completed. Whether blame for want of enterprise, or praise for that slow carefulness which is born of insular conservatism, should be meted to our engineers, I will not attempt to determine; but surely the time has now arrived when the gas-engine and gas-producer have reached that stage of perfection when their adoption is imperative, if this country wishes to hold its own in the economical production of power.

I expect the future development of the gas-engine to follow somewhat on the lines which we have already seen the steam-engine pass through. Large, comparatively slow-running horizontal type steam-engines have their counterpart in gas-engines, such as I have described. Quick-revolution steam-engines, like the Willans and Robinson and the Belliss engines, are not as yet very well represented in gas-engines, at any rate up to the powers which it has been found safe and economical to work with vertical steam-engines. I have shown you the new type of Westinghouse vertical gas-engine, which is to be developed up to sizes of 1000-horse power; and I think, with time and experience, vertical gas-engines up to 1500 brake horse power may find extensive use.

Then we come to the latest development of the steam-engine—namely, the steam-turbine—and we may expect in due course to have the counterpart of this, in the gas-turbine. So long as eight years ago, I fully investigated the theory of the different possible types of gas-turbines; and had I seen any reasonable prospect at that time of making a successful gas-turbine, large sums of money would have been forthcoming to develop it. I had then to advise my clients that I saw no probability that extensive experimental work in this direction would bring about any commercial results; and I so fully appreciated the difficulties in the way of the gas-turbine that I have consistently held this opinion until recently. That the difficulties are not generally understood, is proved by the number of absolutely unworkable proposals which have been submitted to me; and it is only this year that I have come across anything which really looks promising. I am not at liberty to explain the nature of the invention to which I refer; but I expect to be called upon, either at the end of this year or the beginning of next, to carry out trials on a gas-turbine which will have several remarkable features.

There is no doubt that the development of the steam-turbine came at what might be called the correct psychological moment for capturing a great deal of work which would otherwise have gone to gas-engine makers. The low cost at which steam-turbines, coupled to high-speed dynamos, can be purchased, has often proved the deciding factor in considering the type of power installation to be erected; and if the gas-turbine does become an accomplished fact, the last important step will have been taken in compelling the use of a type of prime mover which has a thermal efficiency so much better than that of a steam-engine.

While admitting my enthusiasm for the gas-engine, I do not wish it to be understood that I anticipate that it is going to sweep the steam-engine from the face of the earth. On the contrary, I believe that steam-engines will be built for many years to come, but in increasingly diminishing quantities, as compared with gas-engines. The last field to be entered—namely, that of central station work—will probably be the first to be completely conquered; for it is in large central stations that the greatest benefits from the use of gas-engines can be obtained. Probably the last sphere of usefulness in which the gas-engine will establish itself as the prevalent type of prime mover, will be in ocean-going ships; but already this problem is receiving serious consideration, not only from private firms, but from Admiralty officials. Had I the time at my disposal, I should like to deal with some special types of engines which have been considered suitable for the purpose; but I could occupy a lecture with this subject alone. The oil-engine is practically a specialized form of gas-engine; and it may come as a surprise to my hearers to learn, though I am not revealing any secret, that the Admiralty have a 1000-horse power oil-engine ready to be put into a submarine.

I commenced this second lecture by drawing attention to the American gas-engine which had broken all records for size; but I will conclude it by stating that it is my earnest belief that the English makers will be found equal to the occasion, and that in the demand for large gas-engines, which is absolutely certain to occur in the near future, we shall once again work our way into the front rank.

Junior Institution of Engineers.—At the meeting of the Institution on the 2nd prox., the President, Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer of the Metropolitan Water Board, will deliver his Inaugural Address, which, as may be supposed, will be on the subject with which he has been closely associated throughout his professional career.

Gas Companies' Protection Association.—We learn from the Secretary of the Association—Mr. F. E. Cooper—that the annual general meeting will be held at the Westminster Palace Hotel next Monday afternoon. The business will include the reception of the annual report and accounts, and the election of seven gentlemen to serve on the Committee—six in place of those retiring, and one in succession to the late Sir William Makins, Bart. The retiring members are Messrs. Andrews, C. E. Botley, Chamberlain, Clarry, Helps (Croydon), and Paterson (Cheltenham); and, with the exception of Mr. Helps, they all offer themselves for re-election.

GAS DISTRIBUTION IN A MICHIGAN CITY.

The Fourteenth Annual Meeting of the Michigan Gas Association was held last month at Grand Rapids; and the occasion was considered appropriate for giving the members an account of the system of gas distribution in use in the city. This was done by Mr. A. F. Traver in the following paper.

During the autumn and winter of 1902, Grand Rapids began to have her first serious troubles on the distribution system then in use. During the summer just preceding this, there had been put down several miles of large feeder mains radiating from the works. These lines were laid with the view of putting an end to pressure troubles for many years to come; but, owing to the rapidly increasing business, and to the still more rapid increase in the peak-load due to it, the mains proved inadequate to supply the required amount of gas at the peak hours, unless they had behind them the highest gasholder pressure possible with the existing holder installation.

This condition reduced our available holder capacity to the 300,000 cubic feet of gas contained in the upper lift of the heaviest holder; and as this amount, supplemented by the maximum make of our generating apparatus during the peak hours, could not supply the demand, the holder uncupped several times during the winter before the draw was off, resulting in a decreased pressure upon the distribution system. To remedy this, we installed the next summer a small gas-driven exhauster at the outlet of one of the smaller holders, so connected as to pump from the holder directly into the street-mains; thus rendering some of the gas available for use during the peak hours—the amount being dependable on the maximum pumping capacity of the exhauster during the time it was run. The method of operation was to start the exhauster at the beginning of the heavy pulls, supplying as much gas as we could from the small holder, and thus keep the greatest amount of gas possible in the upper section of the large holder. The maximum capacity of the exhauster, however, was just about equal to the increase in consumption during the peak hours; and we again had the unpleasant experience of seeing the large gasholder uncup before the end of the heavy draw.

The following summer the small exhauster was replaced by a turbine blower set of sufficient capacity to empty the two small holders to which it was connected during the hours of the peak-load. This installation would have taken care of the situation nicely when working in conjunction with the upper lift of the large holder; but we had no sooner put it in operation than we found it necessary to increase our street-main pressure above that thrown by the heaviest holder, owing to the extraordinarily large percentage increase in our peak-load. The blower set, while larger than was necessary for the purpose for which it was bought, was altogether too small to pump all the gas used during the peak hours which was required under the new conditions.

The installation of larger apparatus in the short time given was out of the question, as it was impossible to get deliveries at that time; so an old No. 5 Sturtevant blower and engine, formerly used for blasting a small water-gas set, were pressed into service. There was no time for good foundations, so this outfit was rigged up on timbers placed on the lawn near the turbine set. The air openings of the blower were patched up with galvanized iron plates. A galvanized iron pipe was fitted up as an inlet; the whole outfit, piped up with galvanized pipe, was cut into the line in parallel with the turbine blower; and the thing was started the evening after the first heavy draw came on.

This plant, in conjunction with the turbine set, gave us a sufficient supply of gas for about two weeks. But as the evenings grew longer, the combined output of the two sets was insufficient; and it became necessary (there being no other blowers available) to close all the holder inlets, and put the make of gas on to the street direct from the station meters. In this crippled condition, we managed to get through the winter without any further pressure troubles, and with only one accident. This occured in the dead of winter, and at the time of our heaviest draw. All the apparatus used for putting gas on to the street was run by steam, and one evening one of the tubes on a boiler became loose, and for a time we were without a pound of steam on the works. Fortunately, we were able to get holder pressure on to the street before the street pressure dropped to the danger line. This was the only accident to the outfit; and in view of the poor apparatus and the lack of duplicates, the performance was quite remarkable.

During the summer of 1905, we installed two gas-engines and blower sets, each consisting of a 50-horse power gas-engine and a special No. 10 Sturtevant gas-blower, belted together through a countershaft. Each of these sets had at the time of installation capacity and pressure enough to take care of our requirements for two years, and took the run through last winter without a single accident. This installation as it now stands is far from being all that can be desired, due solely to the use of belts; and we are now installing a positive blower directly connected to a gas-engine, in order to get a line on the respective merits of the two types.

It is not within the province of this paper to enter into a lengthy discussion of the advantages or disadvantages of the different systems of gas distribution; but the author will try to put before the Association in a brief way the system which is believed to be the best for this city, and which will work out best for all others.

Briefly, it consists in utilizing the present mains both as feeders and distributors—increasing the pressure on the lines as may be required up to the safe pressure of the pipe, provided this pressure is within the economic limit. This point is reached when the cost of pumping, *plus* the interest, depreciation, and repairs on the pumping-plant and service governors, and the cost due to increased leakage, is above the interest charge on larger mains to produce the same result; and it is simply a question of figures as to which method may prove the more profitable.

This is almost universally conceded to be the most economical of all distribution systems, and also the most satisfactory, provided it were possible to get perfectly reliable pumping machinery and a really good service governor. It also furnishes a means of keeping the distribution system balanced with the least expenditure of money, as it is almost always possible to meet unexpected pulls from different sections of the city by small main extensions; whereas in laying out a booster system, it is impossible to forecast the future pull from all sections of the city, and should an unexpected draw come from any one, it often necessitates an expensive addition to the booster main. Conversely, should the draw from a certain district fall off, due to some local condition, the loss would be much less with this system, owing to the smaller investment in street-mains.

The most ideal and economical method of pumping the gas is undoubtedly the fan system, put in on the following basis: At the time of the first installation, two fans are installed, each having a capacity somewhat greater than the maximum instantaneous demand, and throwing a pressure in excess of the maximum required on the street-mains at this time. This gives two sets of pumping machinery, each capable of supplying the demand—one being used on the street, and the other kept in reserve for use in case of accident to the first. When the consumption increases beyond the capacity of one fan, a third set is installed—two being operated, and one kept in reserve. When the consumption increases beyond the capacity of two sets, a fourth set is installed, three being operated and one kept in reserve. And so on, as more capacity is required. If during this time, when the initial pressure on the street-mains is at the maximum the fans will throw, and that in the outlying districts in general becomes too low, it will be necessary either to increase the size of the street-mains to meet this condition, or to resort to stage pumping by installing more fans in series with the first sets; the method which will be more economical being found by comparing the interest on the larger mains with that on the extra fan equipment, *plus* the cost of operating and the increased leakage. In case the low pressure is not general in the outlying districts, it will usually be possible to provide for the local low-pressure areas cheaply by increasing the size of short stretches of main at points where it will do the most good, as shown by some careful pressure surveys.

Direct-connected electric motors are undoubtedly the best form of power for the driving of fans. Steam-turbines, direct-connected, are used to some extent. But as these sets are only made in small sizes, they are not available for the larger plants; and, judging from the experience at Grand Rapids, the very high maintenance cost prohibits the use of the smaller size. The fans may also be belt-driven—power being furnished by either steam or gas engines. The use of belts on fans throwing the higher pressures, however, is not very satisfactory, as with the present designs of fans for blowing gas, the fan-speed required for furnishing these higher pressures requires a dangerously high belt-speed. The fan belts on the Grand Rapids installation have a speed of upwards of 8000 feet per minute when the fans are throwing their full pressure—a condition which is not at all pleasant, and which requires the most careful watching. In view of the accident to our steam plant, with its unpleasant after-effects, gas-engine power was decided upon for our fans, based mainly on the theory that so long as we have gas to pump we will have gas to pump with, and would thus be independent of any accidents to our steam plant. This installation has been very satisfactory, with the exception of the belting; and it pumped all our gas during the peak hours of last winter without a single mishap.

The use of direct-connected positive blowers for the purpose of pumping gas requires at the outset the determination of the maximum pressure to be carried on the street-mains, and the installation of enough power at the beginning to drive the blower against this ultimate pressure. This results in an increased investment before it is needed, and also a slightly increased operating cost; thus rendering it less economical than the fan system, although, as compared with belt-driven fans of the present design, it is probably the more satisfactory system of the two. Future additions to this system are, of course, on a basis of capacity only; the pressure being cared for at the start.

The use of this system of distribution naturally calls for a governor on every service where the pressure rises to any great extent, and the success of the system from a economical or a practical standpoint must necessarily depend on the installation of a thoroughly reliable and cheap regulator. Good governors for high-pressure gas have been on the market for some time; but these are not adapted for use on a low-pressure system, owing to the entirely different conditions under which they are to operate. In high-pressure work, the drop in pressure through one governor is of small importance, as there is always an excess of pressure at the inlet; whereas in the low-pressure work, we require a governor which will not only properly reduce the street pressure when this rises above that for which the governor is set, but also one with a valve-opening sufficiently large to pass, with a minimum drop through the governor, an amount of gas equal to the capacity of the meter to which it is attached when the street pressure drops to a minimum. We also need a governor which will give us practically no trouble from either naphthalene or water—a condition which the high-pressure governor does not have to meet.

The problem of designing a governor to meet the conditions of this service, however, does not present any serious difficulties which cannot be overcome; the main trouble being to provide a governor which will fulfil the conditions, and at the same time be comparatively inexpensive. At the time this system was first decided upon, we began looking for a governor which would meet our requirements; but not being able to find one on the market, we set about designing a governor for these conditions. By working in conjunction with a couple of regulator manufacturers, we succeeded in evolving two separate types of regulators, which we think will stand up under the service required, and are comparatively inexpensive. They are both diaphragm governors; mercury governors being unsuited for the future demands of the system unless fitted with very deep mercury wells, which involve the use of a considerable quantity of mercury in each regulator, beside being more dangerous should the mercury be spilled or blown out during high-pressure hours. Again, mercury governors to work properly should be set perfectly level; while diaphragm governors may be set or knocked considerably out of plumb without interfering to any extent with their proper working.

One of these types is a tin-case regulator with an extra large valve opening and a single large diaphragm to furnish the necessary power to close the valve against the high inlet pressure. This type has the regular meter stubs for inlet and outlet connections; thus rendering it very easy to connect the line—a very important item in the cost of the installation. The other form has a cast-iron case and an extra large valve opening; the valve itself being balanced by a small secondary diaphragm, and a large diaphragm controlling the house pressure. This governor is designed for connection into the line before the meter, and has standard pipe-thread connections. Of the tin-case type, we have only made up the 5-light size, as the number of large meters in the district to be covered this year is quite small, and we did not care to go to the expense of getting out dies, gigs, &c., for so small a number until the superiority of this kind had been clearly demonstrated.

Each of these two types of regulators has its points of superiority, and we are dividing up our requirements for this year's work between the two, with the view to finding out just which is more satisfactory under service conditions; but we are satisfied that either of the two is far ahead of anything else on the market for this purpose. The 5-light sizes of these governors will pass 120 cubic feet of gas per hour with less than 2-10ths drop through the governor, at an inlet pressure of 30-10ths, and will hold a 35-10ths delivery pressure with a 600-10ths inlet pressure without "creeping." Again, the diaphragms have been tested to 20 lbs. without showing signs of distress. The valves and valve-seats are so designed that any accumulations of naphthalene or other foreign matter should give very little trouble. From the above, it is apparent that these little governors can easily handle the capacity of the present 10-light meters, though, in view of the increasing use of special large-capacity meters, it might not be policy to instal them on larger than 5-light meters.

In view of the comparatively low-pressure under which these governors will operate, it was at first thought unnecessary to vent them to the open air, on account of the slight danger of the diaphragms bursting. The first few governors were, therefore, installed without vent-pipes; the governors venting through a small hole in the case directly into the basement. It was soon found, however, that in some cases the diaphragm oils absorbed odours from the gas, and imparted them to the air in the case above the diaphragm; and as the air was expelled into the basement as the diaphragm worked, it soon caused a disagreeable smell in the immediate vicinity of the governor. The diaphragms were soaked in different oils and solutions in an effort to remedy this, but without success; and we were obliged to run small lead vent-pipes from each governor to the open air. At the present time, the Grand Rapids Company have installed about 7000 of these regulators on consumers' services; and they are all working very satisfactorily, giving each consumer a nearly perfect service.

Along with the increasing use of gas for many purposes comes the demand for more perfect regulation than we are now able to give with any distribution system without the use of service governors. While most of our present gas appliances work fairly efficiently under variations in pressure, provided the maximum and minimum limits are not too widely separated, there is no question that the nearer these limits are together, the more perfect service we shall give; and it is only a question of time when we shall be compelled, in our own interests, to narrow to a minimum the limits in pressure variation. Then, again, municipalities throughout the country are already clamouring for better pressure conditions on the consumers' premises, as can be noted in the pressure clauses of the gas ordinances being passed in several sections of the country. So far as I know, the Grand Rapids ordinance recently passed (the pressure clause of which limits pressures to between 18-10ths and 45-10ths) is the only pressure-limiting ordinance in effect in this State of Michigan. In view of these facts, we believe that a few more years will see much better pressure conditions throughout the various cities of the country

the best results being obtained by the installation of a perfect service governor on every service.

We do not claim that the Grand Rapids governors are perfect or nearly so—there being many points in which they may be improved; but we do claim that they are far ahead of anything else which has been brought out up to the present time for this purpose, taking into consideration capacity, efficient operation, first cost, and ease of installation. It is altogether probable that the experiences of a couple of years with an installation as large as this at Grand Rapids, together with an increasing demand for this type of apparatus, will tend to bring out still better and cheaper forms, which will ultimately lead to our several companies giving to their consumers a perfect service so far as gas pressure is concerned.

VALUE OF SYSTEM IN GAS MANAGEMENT.

The above subject was dealt with in a paper read by Mr. R. SCHADDELEE at the recent annual meeting of the Michigan Gas Association. Though addressed to an American audience, it contained many hints which gas managers generally may find useful. We therefore reproduce the principal portions of the communication.

The success of any business depends largely upon a good system of conducting it; but in a complex business like ours, comprising many different departments, system is indispensable in order to produce the best results. Time was when the gas manager could depend largely upon a high price for his product to earn dividends for his stockholders; but that time has passed. While formerly the public were willing to pay a high price for gas, and accept indifferent service without much complaint, its attitude at present is to insist upon a low price for gas of good quality and the best of service. The consequence is that the gas manager of to-day must depend, for the success of his company, not upon a high price for his product, but upon a low cost of production, and, above all, upon a large output, large sales per meter and per mile of main, excellent service, and the goodwill of the public. Briefly, he has the following results to work for; and in order to obtain them, he must concentrate his efforts upon effecting a system which will produce them with the least possible expenditure of time, money, and labour: (1) Low cost of production; (2) large output; (3) large sales per meter; (4) large sales per mile of main; (5) large sales per head. He must supply a good quality of gas in sufficient quantity at a fair price; give good pressure at the points of consumption; display a courteous treatment of the public, prompt attention to all complaints and trouble; and give careful consideration to the interests of the city. The final results will be satisfied customers and the goodwill of the public. During the last few years the writer has had occasion to inspect and investigate a number of companies, none of whom were producing satisfactory results, and in most cases this was due entirely to lack of system in the management. It is an efficient system in management that has placed the Company who are to-day our hosts [the Grand Rapids Company] in the proud position they occupy in the gas world.

System means a place for everything, and everything in its place; a time for everything, and everything done in time; a best way of doing everything, and everything done that way. As in physical culture, the aim is to develop all the muscles in perfect proportion and harmony, so the gas manager's object should be to so systematize the different departments of his company that each department will show the highest possible efficiency, and all work in perfect harmony and accord. The head of each department should be a specialist in his line; but the manager should be in close touch with, and posted up in, all the departments—devoting his energies to getting the most efficient results in every branch of his company's business. A manager who concentrates his energy upon one or more departments, to the neglect of others, is very apt to lose in one place what he gains in another. He may obtain low cost of production, a large output, or both, and lose the goodwill of the public—one of the most, if not the most—valuable of the assets of a gas company.

A company may operate without any system, or under an indifferent one, and by sheer luck obtain fair results. But one may rest assured that such a company would show infinitely better results under a good system. Good luck is a very unstable and unsound foundation to depend upon; and no manager should be satisfied with obtaining good results unless he knows how, why, and where they are obtained. It is not sufficient to know you are sick. It is necessary to know the nature and location of your disorder to enable the proper remedy to be applied.

As it is impossible for the manager to watch every detail of the business all the time, it is necessary that he should have a reliable and efficient force of employees, and a comprehensive, detailed system of reports of every department, both daily and monthly. With his personal supervision and a good system of daily accounting and reports, the manager will have no trouble in detecting laxity or inefficiency in any department of his company or in any of his employees. Without system, such laxity or inefficiency will be manifest only in the final results, with nothing to indicate where the trouble exists. The knowledge that a chain is no stronger than its weakest link is but poor consolation, unless one knows which link is the weakest. A gas company is no stronger than its weakest department; and a good system will keep the manager posted as to the relative strength and efficiency of each department.

The rule for the manager and heads of departments should be to pay good wages and salaries for reliable, faithful, and efficient employees. A poor, unreliable employee is dear at any price; and the sooner he leaves the service of the company the better. Even if the manager is personally charitably inclined, under the present keen competition of business life he cannot afford to make his company a reformatory, or to endanger its success by employing incapable and inefficient help, no matter how little they will work for.

Under a good system, the manager must be always posted as to the efficiency and faithfulness of the heads of his departments; and they in turn must be informed as to the merits of the employees of their respective departments. This will enable him to retain and advance efficient employees and get rid of inefficient ones. By an efficient employee I mean one who not only performs ably and faithfully his line of work, but one who works for the interests of his company as though they were his own. He should also work in harmony, and be in sympathy, with the policies and methods of his employers.

Under a good system, the manager will not only receive detailed and accurate reports of his various departments, but will also compare the results obtained with the reports of preceding years. Not content with this, he should, if possible, compare them with results that are being obtained by other companies who are operating under corresponding conditions and are showing excellent results. This will enable him to detect weak points which he might not otherwise discover. When a manager is obtaining excellent results, he should not feel satisfied with them, but should devote his energies to retaining them in the future, and obtaining still better ones if possible. A company cannot remain stationary for a long period. There must be progress, or retrogression is bound to set in.

It is part of a good system to impress all employees with the fact that the interests of the company and those of its consumers are identical; and that therefore all complaints and trouble reported must be received in a perfectly courteous manner, and attended to promptly. Nor must any complaint, whether it be in regard to poor service or about a gas bill, be dismissed until the trouble has been remedied, or every effort has been exhausted to adjust the complaint to the satisfaction of the customer. The manager should keep in close touch with the trouble department; and no effort or cost should be spared to remedy the troubles of the consumers and to prevent their recurrence—above all, to prevent their occurrence. Time and money spent in keeping present customers satisfied are even a better investment than time and money spent in obtaining new customers.

In deciding upon extensions of the mains, a good system requires that the decision come to should be not merely from the standpoint of the interests of the company, but after due consideration has been given to those of the public. An extension may not promise an immediate monetary profit from the consumers in sight, and yet the conditions may be such that it is advisable and expedient to make the extension. The manager should be able to come to an intelligent decision in such cases. In fact, in formulating and carrying into effect any policy affecting the consumers or the public, their interests should be given due consideration.

To obtain a low cost of production, it is necessary that the utmost economy should be used in all departments, both in labour and material. The small economies are more important than the large ones, because the small leaks are not so easily detected. Also, if you train your employees not to waste anything, not even scrap-paper, the practice of economy will soon become second nature to them. Few people realize the power that number bestows on things in themselves insignificant. Yet the large traction companies, with investments and expenses running into millions, make their expenses and earnings solely from nickels. Train your employees systematically in the practice of economy in every particular.

At the works, system must be employed in the operation, repair, and construction of the apparatus; nor should the manager be satisfied until each piece of apparatus is performing its function in the most efficient and economical manner. Construction work should be done in time to make the manufacturing and distribution systems keep pace with the increasing business, so as not to run any chances of poor service due to lack of capacity, which will also cause expensive operating. Complete and detailed reports should be rendered to the manager each day and every month, giving all the essential information about each department. All material used from stock, either in construction or operation, should be accurately reported. No guesswork should be allowed; but all material used must be weighed, measured, or counted.

In determining the earnings and expenses for the month, the manager must be sure that all items properly belonging to the month are included in the figures, and that all bills have been charged to the proper account. This is very important; for unless it is done, the statement will show the earnings either larger or smaller than they really are. Be honest with yourselves and your stockholders.

System in the distribution department means that all pipes are laid in the proper way, and are of ample size; that the interests of the city and the public are properly looked after in necessary

excavations; that meters are of proper size; and that a good pressure and supply are maintained at the point of consumption. All drips must be pumped at stated intervals, and the utmost measures taken at all times to prevent stoppages of pipes or poor or interrupted service from any cause.

System in the office means that all records and accounts are kept in proper shape and kept up to date. All orders finished during the day should be returned to the office the next morning, and immediately posted in the proper books of record and accounting. Meters should be read as near as possible the same dates each month, and bills delivered to consumers. The force of employees must be sufficient and competent to discharge their various duties. Office, sale-room, and stock-room must be kept scrupulously clean and in perfect order. All persons entering the office must be promptly and courteously waited upon, whether their object is to buy a gas-range, pay a bill, or kick about the amount thereof.

All the different appliances and burners must be kept so as to exhibit their advantages in the best possible manner, and connected up in order to demonstrate their operation. The offices and sale-rooms should be arranged for the convenience of the customers, and should be a credit to the city in which the company operates.

Invoices for appliances, tar, coke, &c., should be rendered promptly, and statements made out the first of each month of every account receivable on the books of the company. These statements must be kept in the hands of the collector or in the office file until paid, and not, under any circumstances, be destroyed or left with the customer. On the back of each statement the collector should enter the date of each call, with the result. With a good system of collecting, a manager will not feel the need of substituting prepayment meters for his collectors, except in case of transients, or exceptionally hard cases.

In the new business department, system demands that a card index be kept of each house on the line of the mains, showing all the necessary data, so that the representative can arrange his visits intelligently. Every month a list should be made out of dead-services and of consumers using small quantities of gas or not any, so that the energy of the representatives can be concentrated on this class of prospective business. Nor should the efforts of the company be limited to obtaining new consumers or increasing the sales of gas to present ones. Just as much energy should be employed to look after the wants and troubles of the latter, to see that their appliances and burners are kept in proper condition, and that they get the best results out of the appliances already installed.

System should also be used in advertising, so that only that class is employed that will produce the best results with the least expenditure of time and money, taking into consideration local conditions. The best advertisements for a gas company are an excellent service, prompt attention to all orders, and courteous, considerate treatment of everybody. These will result not only in increased sales, but also in the goodwill of the public—thus adding to the value of two of the most valuable assets of a company. Add to this attractive newspaper advertising throughout the whole year, and especially persistent personal solicitation by capable, gentlemanly representatives. A good, efficient body of representatives will bring in more business, and result in more benefit to the company, than all other forms of advertising combined, except excellent service. But to obtain efficient results in the new business department, it is just as necessary to employ system as in the manufacturing and distribution departments. The representatives should follow up every prospective consumer systematically, making a house-to-house and floor-to-floor canvass in their territory as often as possible. They should have enthusiasm both for their business and for the company employing them. They should always remember that they are the gas company to the persons they call upon, and must never forget that their mission is threefold: (1) To increase the sales of gas; (2) to adjust, or report to the office for investigation, all complaints and troubles; and (3) to cultivate a kindly spirit among the public towards the gas company.

Perhaps none of us can attain the ideal system I have set forth, nor have I given it as an existing perfect reality; but it is worth much to have an ideal. The ideal of the past is the reality of the present; and we may hope that our ideals of the present will be realized in the future. Ideals cease to be ideals when they are realized. Our ideals travel as fast as we do. But in pursuing them we surely make progress; and progress must ever be the watchword of the gas industry, for it is progress that has made gas one of the most necessary factors of present civilization.

Midland Association of Gas-Managers.—As was previously announced in the "JOURNAL" (*ante*, p. 109), the autumn general meeting of the Association will be held in Birmingham next Thursday, under the presidency of Mr. Fletcher W. Stevenson, of Coventry. We learn from the circular issued by the Hon. Secretary (Mr. Charles Meiklejohn, of Rugby), that the only business, in addition to the papers by Mr. T. Berridge, of Leamington, and Mr. S. Glover, of St. Helens, already mentioned, will be the election of new members and the announcement by the President of the names of the office-bearers for the ensuing year. The new President is Mr. J. H. Brown, of Nottingham; and Mr. Hubert Pooley, of Stafford, is the Vice-President. At the close of the business the members will dine together.

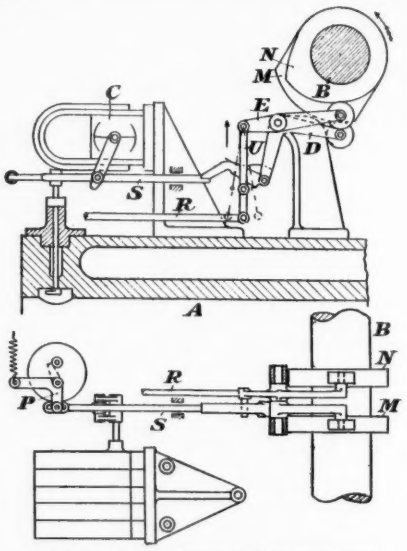
REGISTER OF PATENTS.

Timing the Ignition of Gas-Engines.

CAPITAINE, E., of Reisholz, Germany.

No. 15,277; July 5, 1906. Date claimed under International Convention, July 6, 1905.

This automatic adjuster or regulator of the time or moment of ignition in gas-engines by means of the speed governor is shown in the engraving—a part sectional elevation of so much of a gas-engine as is required to explain the invention, and an underneath view of the mechanism.



Capitaine's Gas-Engine Igniter Regulator.

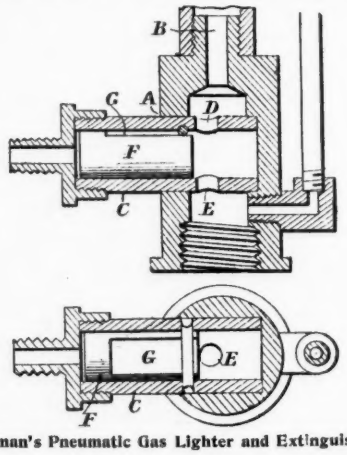
A is the cylinder of the engine; B, the cam shaft; C, the magneto-electric igniting apparatus; D, an angle lever adapted to turn on a pin and through a connecting piece to push (or in a vertical engine, to lift) the rod S for the purpose of turning the armature of the magneto-electric igniting apparatus through a certain angle in a known way. The connecting piece engages in a recess or against a shoulder provided on the end of the rod S; and E is a lever (also turning on the pin) moved by a cam N, and the lever D by the cam M. When the shaft B revolves in the direction of the arrow, a movement of the lever D first takes place, in such a manner that the armature of the igniting apparatus is brought into the requisite position for the spark formation. Further, the lever E is moved by the cam N, so that a stud projecting from the rod U strikes against the oblique edge of the connecting piece, and pushes it to one side, whereupon the rod S is slid back by the action of a spring (not shown), or, in a vertical engine, falls by reason of its own weight, and the armature of the magneto-electric apparatus is thereby rapidly turned through the required angle. At the same time the contact-breaking lever P has its contact-breaking movement communicated to it. A rod R is jointed to the end of the rod U to connect with the speed governor; and, according as this rod is in one of three positions, the oblique edge is struck earlier or later by the stud to release the igniting apparatus.

Opening and Closing Gas-Valves from a Distance.

OAKMAN, R. N., of New York.

No. 4175; Feb. 20, 1906.

This invention relates to apparatus for operating gas-valves, so as to light or extinguish gas at a distance, of the kind wherein a piston is



Oakman's Pneumatic Gas Lighter and Extinguisher.

reciprocated pneumatically in a chamber provided with a duct leading from the rear of the chamber to the gas-outlet. In devices of this kind

as hitherto made, the piston is provided with a peripheral groove serving as a passage-way for the gas, and "consequently the piston is longer than is necessary to effect its purpose of opening and shutting off the gas supply." The object of the present invention is to provide a valve of the kind referred to wherein the piston has no such peripheral groove or passage—the gas finding its way past the rear of the piston, which closes the ports when its body covers them and opens the ports when its end has passed beyond them.

In the socket shown for attachment to a gas-pipe is made a transverse bore A, and a longitudinal passage-way B to the burner. Within the bore A is inserted the cylinder C, provided with the ports D and E, adjusted to correspond with the passage-way to the burner, and also provided with a nozzle to connect with any of the well-known devices (not shown) for exhausting and compressing air or other fluid, so as to reciprocate the solid piston F to close the ports D and E, when driven towards the rear of the cylinder, or to open them when withdrawn until its end has passed beyond the ports.

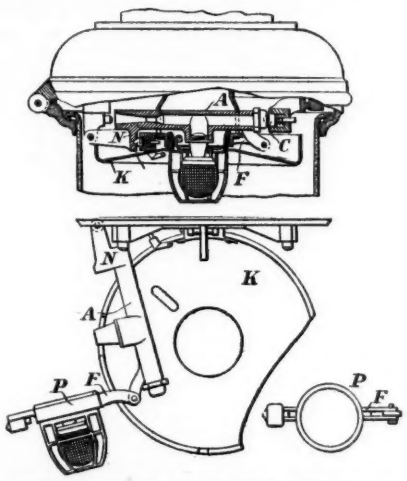
When the piston F stands ready to pass over the opening or port E and close it, the plane, flat surface on the periphery of the piston extending to its inner end leaves the whole body at the other end to prevent the passage of air or gas. This flat surface provides or forms a duct from the rear end of the cylinder to the passage-way B, to permit the escape of gas or air which may be present at the end of the cylinder, and to permit the entrance of air from the passage-way into the cylinder beyond the inner end of the piston. A cross pin through the cylinder over the plane surface prevents the piston from turning.

Inverted Incandescent Lamps.

IMRAY, O.; communicated from JULIUS PINTSCH, of Berlin.

No. 2058; Jan. 26, 1906.

In this lamp, the reflector and burner-tube are hinged so that when they swing downwards they hang clear of each other. The mantle-holder is hinged at the free or outer end of the burner-tube, and is secured in the operative position by a spring or other catch engaging the bunsen tube. When the burner-tube is lowered and the catch released, the mantle-holder may be swung outwardly to an extent which allows the easy replacement of the mantle if necessary.



Pintsch's Inverted Incandescent Lamp-Burner.

The hinged burner-tube A is held in a horizontal position in the lamp by the spring plug C. The reflector K is so hinged to the lamp-casing that when it and the burner-tube swing downwards they hang clear of each other. The free end of the burner-tube is provided with a projecting lug, to which the mantle-holder F is pivoted, and is secured in its operative position by a pin springing into another lug N projecting from the hinged end of the burner-tube. The mantle-holder is constructed with a ring-shaped enlargement P, in which the protecting screen for carrying the mantle is inserted, and which in the operative position encircles the depending outlet of the burner-tube.

When this arrangement of mantle-holder is applied to inverted lamps like those described in patent No. 3876 of 1905, the nipple, the burner-tube, the reflector, and the mantle-holder and mantle all hang clear of each other in the disengaged position—thus making all the parts readily accessible.

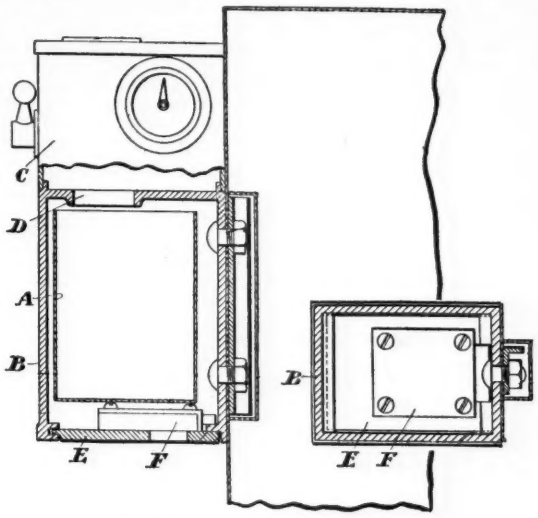
Cash-Box for Coin-Freed Gas-Meters.

COLSON, A., of Leicester.

No. 5931; March 12, 1906.

This invention has for its object to provide means for the effectual retention of the coins inserted in the meter, while enabling them "to be very conveniently and readily withdrawn by the collector or other authorized person."

In the arrangement shown, the cash-box or coin-receptacle A consists of a plain open-top box made up from tinned plate or sheeting. The protective casing B (also of box form) may be said to constitute an outer cash-box. It has its lower end open, and is preferably of sufficient strength to afford protection to the inner cash-box A. The outer box is fixed to the meter just below the casing C of the coin-freed mechanism, so that the coins from the latter can pass through an aperture D in the top of the outer box to the inner box A. The open lower end of the outer box is closed by a detachable base piece E, with a lock F controlled by a key held by the collector. One end of the base piece is inserted between a pair of lips, ledges, or internal projections from the corresponding end of the outer box, while the opposite end abuts against a single lip or projection from the other end of the outer box. When the base piece is unlocked, it can be readily detached to allow of the withdrawal of the inner box or coin receptacle; but when the base piece is locked, after it has been placed in position, the bolt of the lock projects over the inner side of the single lip or projection, and thus effectually holds the base in position.



Colson's Prepayment Meter Cash-Box.

When the base piece is detached, the inner cash-box will not immediately drop out, as it is retained by one or the other of the internal lips. It can, however, be easily removed by tilting or sliding it off the lip.

The outer cash-box is preferably secured to the meter casing by bolts and nuts; and strips or washers of comparatively thick metal are preferably provided on the inner side of the meter casing to stiffen and strengthen the latter. To prevent leakage of gas from the meter through the bolt holes, a sheet metal cover or cap is placed over the nuts on the inner side of the meter, and also over the plate, and made gas-tight by soldering.

Gas-Engines.

THOMPSON, W. P.; a communication from W. L. MORROW, of Stockton, California.

No. 4196; Feb. 20, 1906.

This invention relates particularly to the cylinders of gas-engines; its object being to produce a double two-stroke-cycle gas-engine having "greater efficiency than the gas-engines at present in use." Also an engine in which the explosions drive the pistons outward from the centre of the cylinder body, and one which has a substantially continuous drive, and requires a minimum momentum. This object is accomplished by forming the cylinder body with two chambers separated by a central partition wall, and providing each chamber with an arrangement of ports and a piston adapted to open and close these ports—the two pistons being connected together and arranged so as to transmit their drive to a fly-wheel or the like.

Gas-Engines.

CROWE, E., of Redcar.

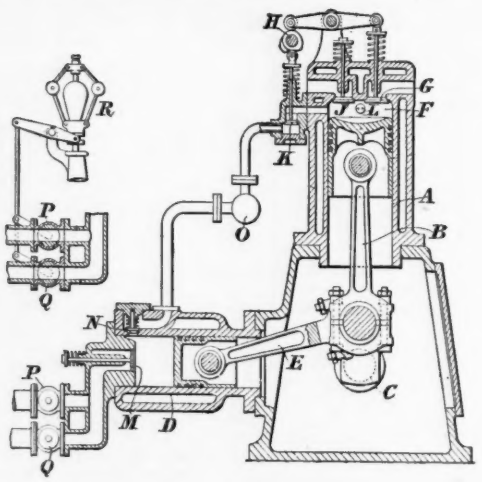
No. 6607; March 19, 1906. Date claimed under International Convention, March 23, 1905.

This invention relates to internal combustion engines of the type wherein the air required for effecting complete combustion of the fuel is compressed alone in the cylinder, while the fuel is admitted to the combustion chamber only at the moment of ignition. In consequence of this arrangement, "engines of this type are capable of developing much higher powers than those wherein the constituents of the explosive charge are mixed prior to, or during, compression, and wherein therefore the power obtainable is limited in consequence of the necessity for avoiding compressing the mixture so far as to raise its temperature to a point at which spontaneous ignition is liable to occur." In the present invention, the gaseous fuel is compressed and introduced into the previously compressed charge of air—ignition being effected not spontaneously, as hitherto, but by means of an ignition device, so that the necessity of compressing the charge of air to such an extent is obviated.

The illustration given on p. 252 shows an elevation of one form of engine constructed according to this invention—in section on the plane wherein lie the axes of the motor and pump cylinders—and, at the side, the means of automatically controlling the fuel supply.

A is the cylinder, the piston of which is coupled by the rod B to the crank on the shaft C. D is the pump cylinder, whose piston may be coupled by the rod E to the crank (or to a crank co-axial therewith) when (as illustrated) the axes of the two cylinders are at right angles to one another. The cylinders A and D are provided with cooling jackets throughout their effective length. F is the compression space at the rear end of the motor cylinder—the air and fuel inlets, and the exhaust, all opening through the walls of this space. The exhaust-valve G of the cylinder closes outwardly, and is opened against the pressure of the spring shown by a cam mounted on a shaft H revolving at one-half the speed of the crank-shaft C. The cam may actuate the valve G through a lever, as shown. J is the air-inlet valve of the cylinder, which may

be arranged to open automatically against the pressure of the spring during the suction stroke of the piston in A; the pressure generated within the cylinder during the working stroke serving (conjointly with the spring) to then hold the valve closed. The fuel-inlet valve K of the cylinder closes inwardly, and is opened at the end of the compression stroke of the piston in A against the pressure of the spring by means of a cam rotated by (or at the same speed as) the shaft H; the cam being of such form as to allow of the introduction of the fuel proceeding at a rate corresponding to that at which combustion progresses. A sparking plug is provided in the compression space F as at L. M is the fuel suction valve at the rear of the pump cylinder D. This valve opens inwardly against the pressure of a spring at each suction stroke of the piston in D. N is the pump delivery valve, which may open outwardly against spring pressure, and which is connected to the fuel-inlet valve K of the cylinder by a pipe, whereon an intermediate reservoir O may be provided. The supply of fuel to the cylinder D is regulated by the engine-governor R, which is made to actuate valves as at P and Q on branch pipes leading to the valve M. The valve P controls the admission of gas, and the valve Q that of air when used to form a non-explosive mixture before compression.



Crowe's Gas-Engine.

When the engine is running light and the minimum quantity of gas is being used, the terminal pressure in the working cylinder A will be only slightly higher than atmospheric pressure; but as the load increases and a greater quantity of gas is admitted to the cylinder A, the terminal pressure will rise in consequnce both of the increased volume of gases in the cylinder and the higher temperature developed. Hence the most economical working conditions are said to be attained at a point between no load and full load, above which intermediate point the engine "will possess a considerable reserve of power, which can be exerted on emergency, but which, owing to the higher terminal pressure resulting from its development, would be employed under somewhat less economical conditions."

With a view to employing the engine to the greatest advantage by increasing as much as possible the volume of gases within the cylinder during the working stroke, the patentee prefers to mix with the combustible gas or vapour drawn into the pump cylinder D as high a proportion of air or inert gas as the quality of the combustible gas employed renders advisable. Thus, for example, when using town's gas or coke-oven gas the proportions of the mixture drawn into D may consist of one volume of combustible gas to (say) two or three volumes of air or inert gas, or thereabouts, according to the quality of the combustible gas. Supposing, therefore, that the proportions required in the final mixture within the cylinder A at maximum load are nine parts of air to one of rich combustible gas, while the mixture within the cylinder D is composed of three parts of air or inert gas to one part of combustible gas, the capacities of the pump and motor cylinders would require to be as four and six respectively. Under these circumstances, the capacity of the motor cylinder being six, the total volume of gases doing work within it at maximum load will be ten. If, however, blast-furnace gas or producer gas be employed, the proportions required in the final mixture within the cylinder A may be (say) about two volumes of such gas to three of air; and as blast-furnace and producer gas are weak and already contain a larger percentage of nitrogen, further dilution by means of air (admitted to the cylinder D) is not advisable. Under these circumstances, the relative capacities of the pump and motor cylinders would be as two and three respectively, or the same as when using town's or coke-oven gas.

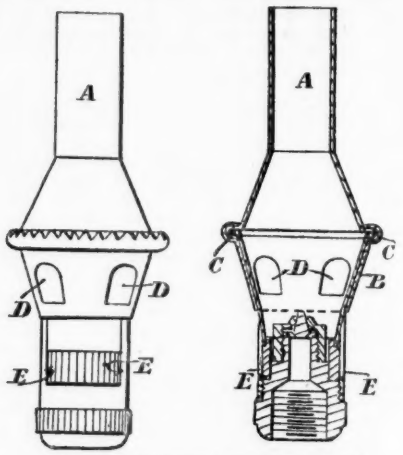
Regulators for Incandescent Gas-Burners.

BLOCK, E. H., of Cock Lane, E.C.

No. 11,082; May 11, 1906.

This invention refers more particularly to burners in which the regulation of the gas is effected simultaneously with the regulation of the air supply by rotating the mixing-tube, which is in operable connection with a screwed cap arranged upon the gas-nozzle. The present invention provides a regulator disconnected from, and operable from, the exterior of the mixing-tube, whereby the gas supply is regulated independently of the air supply.

The general arrangement of the air-valve is as described in patent No. 28,095 of 1903. Instead, however, of arranging the slide for governing the admission of air in the manner then illustrated, it is arranged as shown at B, where the upper portion of the slide is turned over the bead C formed at the junction of the upper and lower members of the tube A. The arrangement is such that the slide is freely revolvable in



Block's Incandescent Burner Regulator.

order to regulate the admission of air through the apertures D. The lower end of the tube A is provided with an extension perforated at E; the walls of the tube above such perforation being incised or otherwise treated, so that it may be turned or bent inwards and incline away from the line of the outer wall.

Gas-Retorts.

JERRATSCH, T., of Schwerin, Germany.

No. 8433; April 7, 1906.

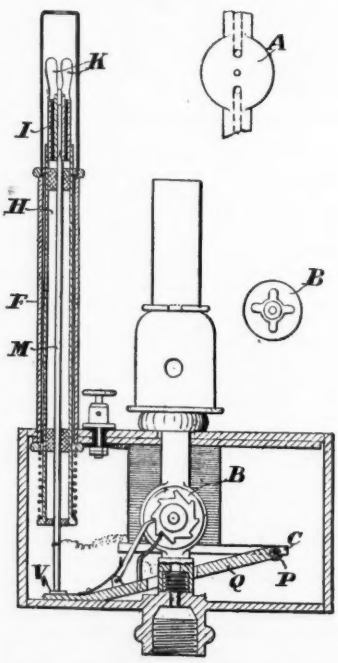
This invention, which was referred to in the "JOURNAL" for Sept. 25, p. 831, is "characterized by the fact that the front part of the retort, which serves for the fixing of the casing, or both the end parts, are formed as separate head-pieces fitted to the masonry and serving for the support of the middle part."

Lighting and Extinguishing Gas-Burners from a Distance.

BIRNBACH, H., of Vienna.

No. 13,417; June 11, 1906.

In accordance with this invention, the igniting body (a platinum wire, a platinum loop, or the like), is arranged within a protecting casing so that it is normally beyond the range of the gas escaping from the burner, and is brought within this range only when it is to be used; while, after having ignited the gas, the igniting body is again removed out of the range of the gas.



Birnbach's Automatic Lamp Lighter and Extinguisher.

The gas supply-pipe is provided with a strengthening piece A, into the front surface of which the gas-pipe opens. Against the surface there presses gas-tight a rotatable disc B, which, on the side that is turned towards the strengthening piece, is provided with a number of radial passages arranged in the form of a star, and all of which open

into a common central annular passage or into a depression. It is advantageous to arrange four radial passages at intervals of 90°, as shown in the detail. The disc B is connected with a ratchet-wheel, which, when rotated alternately, brings the disc into the two positions in which the radial passages, on arriving at the two apertures, connect the apertures with each other and enable the gas to flow to the burner, or in which they are covered by plain parts of the disc—that is to say, in which the gas supply is cut off from the burner.

In the box which surrounds the strengthening piece there is arranged, upon a stationary iron bed-plate C, a pair of electro-magnets, the armature Q of which is arranged on the bed-plate, to be freely rotatable about the axis formed by the pointed screws P. To the armature there is attached a spring pawl, which engages with the ratchet-wheel, and which, when the armature is raised by the energizing of the electro-magnet, rotates the ratchet-wheel, and with it the disc B, in such a manner that the latter is brought into the position which connects the two parts of the gas supply-pipe. When, after the current which passes through the coils of the magnet has been interrupted, the armature again drops, the pawl slips back freely over the teeth of the ratchet-wheel. When current is again supplied, the armature, again attracted, effects the rotation of the disc B into the position in which it again disconnects the parts of the supply-pipe.

To the casing there is attached the pipe F, within which a second current-conducting pipe H is displaceably arranged. This pipe is, by means of a spring, usually retained in the lower position, and carries on its upper end a current-conducting piece of piping I, which is screwed in, and has inserted in it a sleeve which is electrically disconnected from it by means of an intermediate insulating piece. One end of a platinum wire K, which acts as the igniting body, is connected with the piping I, while the other end is in current-conducting connection with the sleeve. Over the piping there is pushed a cap provided with apertures, and which, on the one hand, protects the incandescent mantle of the burner and, on the other, the platinum wire or loop against the heat of the flame. Throughout the inner pipe H there extends a rod M, which is insulated from it, and the lower end of which rests on the armature, from which it is, however, electrically insulated by an intermediate piece V. The rod M, the upper end of which is pointed, is connected by a wire with one end of the winding of the electro-magnet, the other end of which is joined by wire to a terminal insulated from the casing. If by means of a key the circuit from a battery (not shown) be closed, the current flows through the terminal, the wire, and the windings of the electro-magnet, whereby the armature will be excited and the results described will be produced.

Assuming that the burner passage is opened by the raising of the armature, which is attracted by the electro-magnet simultaneously with its upward movement to raise the pin or wire M, this wire, by means of its pointed upper end that penetrates into the bore of the sleeve, also raises the piping I and the platinum wire, so as to bring the wire within the range of the gas flowing out of the burner. The electrical connection of the rod M with the inner sleeve being effected, the current passes through the platinum wire K, and thence, through the exterior piping I and the pipe H, back to the other pole of the source of current—causing the platinum wire to become incandescent and ignite the gas. Consequently, the platinum wire is only rendered incandescent for the purpose of igniting the outflowing gas after the contact between the wire M and the sleeve I has been effected, while the gas supply has already been opened by means of the pawl, ratchet-wheel, and disc B.

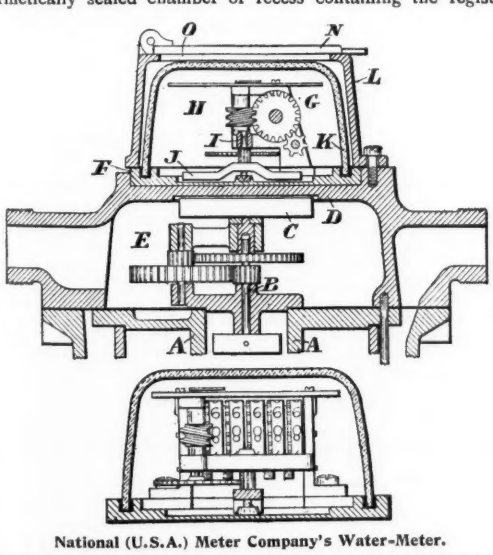
The cap shown protects the platinum wire or loop against injury, and renders it considerably more durable; for while the flame is burning, the platinum wire is concealed in the cap, and is consequently also protected from the action of the flame.

Water-Meters.

LAKE, H. H.; a communication from the NATIONAL METER COMPANY of U.S.A.

No. 19,479; Sept. 26, 1905.

This invention has reference to meters of the kind in which a magnet within the main or meter casing is employed to actuate a magnet within a hermetically sealed chamber or recess containing the registering



National (U.S.A.) Meter Company's Water-Meter.

mechanism, so as to drive the mechanism and establish operative connection between the mechanism contained in the closed chamber and that in the main casing respectively without the necessity of providing any aperture leading from the one to the other.

A is the upper casing of the measuring-chamber of a water-meter. There is a projection on the shaft B against which the spindle of the piston of the meter presses. E is the train of speed-reducing gears, and C is a permanent magnet revolved by the gears. D is the upper casing supporting the register-mechanism case, which is composed of a base F and a dome K, of glass, hermetically sealed to the base. G is the register, which is driven by the shaft I, upon the lower end of which is fixed the permanent magnet J within the field of the magnet C. L is a protective cover attached to the meter case and provided with the opening O and the cover N. It forms a shoulder over the base plate of the chamber containing the register mechanism and holds it in place, but permits it to rotate.

The case of the register mechanism is independent of the case D, and is not rigidly fastened to it. Therefore, after the meter has been connected with the main, it may be turned through any desired angle to facilitate readings. The axis of rotation always coincides with that of the members J and C, by making the base-plate F circular, resting in a circular depression in the head D.

APPLICATIONS FOR LETTERS PATENT.

22,134.—THORP, T., "Gas-governors." Oct. 8.
22,216.—MURINICK, A., "Burner." Oct. 8.
22,238.—MIDDLETON, C. E., F. P., & A. T., and SOUTHWORTH, G., "Incandescent burners." Oct. 8.
22,246.—THORP, T., "Water-meters." Oct. 9.
22,308.—JEAN-BAPTISTE, M., "High-pressure lamps with inverted mantle." Oct. 9.
22,379.—HATFIELD, H. S., "Gas-measuring apparatus." Oct. 10.
22,403.—ANDERSON, J., "Gas-cocks." Oct. 10.
22,405.—WEIR, A. S. J., and HENNING, T. J., "Gas-meters." Oct. 10.
22,408.—BATTERSBY, R. H., "Cocks for gases and liquid." Oct. 10.
22,478-9.—WIEGLEB, H., "Gas-engines." Oct. 11.
22,493.—PODMORE, A. E., and THOMAS, J., "Gas-lamps." Oct. 11.
22,511.—CARPENTER, C. C., "Gas-governors." Oct. 11.
22,563.—EADY, L. H., "Reducing the consumption of gas by incandescent burners." Oct. 12.
22,571.—ATKINSON, T. N., "Incandescent mantles." Oct. 12.
22,638.—CATLING, J. T., "Ascension-pipes." Oct. 12.
22,690.—GELPKE, V., and KUGEL, P., "Gas turbines and fans." Oct. 13.
22,705.—WILTON, T., "Purification of gas and recovery of bye-products." Oct. 13.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by Correspondents.*]

Sulphur Restrictions.

SIR,—I venture to suggest to those gas companies remaining under sulphur restrictions, that they might wisely follow the example of some fourteen or fifteen companies that last year, on the initiative of the Gas Companies' Protection Association, successfully promoted a Joint Bill to obtain relief.

There were two or three years ago close upon fifty companies subject to these restrictions. Some obtained relief separately; the London Act of 1905 freed the three large Metropolitan Companies; and with the fourteen or fifteen referred to about half are now free. There are in the remainder a number of important companies; and some of them I am informed intend to introduce a Joint Bill to repeal the restrictive clauses. But why not all; for it would be a grand thing to see every British Gas Company relieved from this useless, vexatious, and expensive obligation once and for all.

If there is any hesitation, it is probably due mainly to several causes. Some of the companies under sulphur restrictions are not troubled by the local authorities; and these companies may say "Let sleeping dogs lie." But they may wake up at any time and give much trouble. In those cases it is not probable that there would be any opposition to the Bill. The directors of other companies may not have had their attention drawn to the question, and therefore do not realize the difficulty of keeping the sulphur compounds below the limit fixed by their Act, or the nuisance and expense attending the use of lime for purification. Others, again, are deterred by the cost of obtaining a Bill; but if they unite with others, it will be very trifling. Moreover, whatever it be, it will be saved in the first year, and certainly cannot adversely affect the profit or the dividend. The last objection, if valid, would be the most serious—viz., the opposition of the local authorities. Last year's Joint Bill was threatened with opposition by many of the local authorities; but all withdrew except the important City of Newcastle-on-Tyne. That Corporation most strenuously opposed, with many scientific and other witnesses, but utterly failed, and the Bill passed both Houses intact.

The fact that Parliament passed the London Bill (the London County Council opposing) in 1905; and another Parliament passed the Joint Bill of the Gas Companies' Protection Association (Newcastle opposing) in 1906, renders it extremely unlikely that there will be any opposition to another Joint Bill in 1907.

May the hope be expressed that every company now under sulphur restrictions will take the opportunity, *that is not likely to recur*, of uniting in a joint effort for freedom. If all agree, the cost will be insignificant, and success may confidently be expected.

GEORGE LIVESEY.

Oct. 20, 1906.

The contributor of "NOTES FROM WESTMINSTER," writing on the subject of the promotion of another Joint Bill for the removal of the sulphur restrictions, says:

There are now only about twenty gas companies in the whole of the United Kingdom who are chained to that superfluity, the removal of a few additional grains of sulphur compounds by what may be described

as—having regard to the disproportionate amount of good achieved—a cumbrous, expensive, and nuisance-involving process. The hope was expressed by Sir George Livesey in the "Correspondence" columns of the "JOURNAL" last week (he took no credit for, but no one will forget, the dogged work of the London Gas Companies, and especially of the South Metropolitan Company, in this matter) that the Gas Companies' Protection Association would, in the next session of Parliament, complete the good work that they began in this year's session, by bringing relief to those companies who are still under the restrictions. "Let us hope," added Sir George, that "all those companies will have the wisdom to seize the opportunity of getting the relief at the minimum expense, which will certainly be saved the first year." That is the whole point—as to whether the companies will have the wisdom to join in the promotion. Without them, the Gas Companies' Protection Association cannot possibly produce finality in this regard. However, the prospect is good for another Joint Bill being promoted on the lines of that of last session; and it is desirable that as many companies as there are now under the restrictions should unite in removing the last traces of this stupid drag on gas-manufacturing operations. Four companies have already provisionally agreed to join in the promotion of a Bill next session; and it is to be hoped the remnant of sixteen or so will, without the slightest hesitation, announce their adhesion to the movement.

Possibly some of the companies are considering the question as to the prospect of conflict arising with their local authorities by taking part in the promotion. If so, they are wasting time in giving the matter thought. There is no need whatever to obtain the acquiescence of the local authorities in this particular connection; and we strongly advise gas companies not to attach any importance to it. To do so, over such a simple affair, is only inviting the local authorities to—for it is tantamount to it—levy blackmail as the price of their goodwill. The history of this removal of sulphur compound restrictions has only to be considered to show the absurdity of a local authority opposing, or of a company fearing their opposition if foolishness or extravagant views as to their power get the upper hand of them. Last year only the Newcastle Corporation appeared in opposition to the Joint Bill; but powerful as are the Newcastle City Council, their representatives had to leave Westminster, after the discussion of the question before a Parliamentary Committee, wiser (if not sadder) men. Other local authorities had realized the strength of the gas companies' position; the Newcastle City Council had not. But they did eventually. Gas companies who join in the promotion of the Bill next session will do so strongly fortified; for have they not the precedents of the Joint Bill of this year, of the London Gas Act of 1905, and of the Acts of other companies who have, independently, this session obtained the relief desired? In unity there is strength; and a Joint Bill does not give the same opportunity to a local authority for exacting concessions as an individually promoted one. It is a good time to finally wipe away the stringency of this ill-conceived enactment. To those gas companies, therefore, who are wavering on account of their local authorities, it may be said: Remember the courteous firmness that the Newcastle and Gateshead Gas Company, knowing that they had right on their side, displayed last year, and remember, too, the result. The City Council are not worse friends with the Company because the latter were the victors in the fight.

The Tar Question.

SIR,—Sir George Livesey's knowledge of matters relating to the supply and demand of tar is undoubted, and entitles him to write with authority as to what should be the policy of gas companies with respect to it. But I fail to see anything in the quotation he makes from my address to the North of England Gas Managers' Association which should lead him to consider I am not familiar with the elementary facts which, in his opinion, are knowledge common to all gas men, and which are embodied in the second paragraph of his letter in your last issue.

The cause of his fault-finding is to me still more obscure, when, in the third paragraph of the letter, he practically endorses what I said, in the words "for the half sold for road making and repairing, or for fuel, we should certainly get as good a price as we now obtain from the distillers"—that is, he admits it will be necessary to sell tar at a low price for these purposes to maintain such a demand as would affect to any extent the price of the quantity to be sold to the distiller.

I merely ask in my address how these two prices are to be maintained. This is the only important point in connection with the matter; and it is still open to determination.

T. HARDIE.

Redheugh Gas-Works, Gateshead-on-Tyne, Oct. 20, 1906.

Coal and Coke Handling Plants.

SIR,—In the editorial article dealing with the Junior Associations in the last number of the "JOURNAL," you very rightly remark that the record of useful work done stands much to their credit. In the paper of Mr. W. Angus, for instance, we get the result of years of practical experience expressed in a concise way, and in language certainly not below the standard set by the Senior Associations. Also the discussion arising out of the paper was so very much to the point that all who are interested in the future of the gas profession will have confidence, given such coming engineers and managers. Mr. Angus desired a more keen discussion of his paper; and so perhaps he will be glad of a few remarks from an old shopmate who has devoted many years to the manufacture of conveying plants. He need not be surprised at the small amount of discussion, as this is due to the fact that the paper disarms criticism, dealing as it does so well with all branches of the subject.

The crusher (fig. 1) which Mr. Angus condemns is not made in this country, except in one case, where it is ordered to be a facsimile of some already in use in these particular works. If the gear-wheels on the crushers are made in cast iron, with teeth of large pitch (say 1¾-inch), no trouble is experienced; and should a piece of steel get into the claws, the spur pinion would break before the claw fractured. Even where a belt-drive is employed, a claw may fracture before the belt slips, owing to the amount of intervening spur reducing gear. Double-shrouded wheels are an abomination. They not only lead to accident, as explained by Mr. Angus, but also necessitate the removal of two or more wheels, in case of such accident to one—a very difficult operation in a dark crusher pit.

I am rather surprised that no mention was made of automatic regulators to feed the coal from the hopper to the crusher. Doors, even when divided to open right and left, as described by Mr. Hewett, do not overcome the difficulty when large coal is used. The reciprocating shoot introduced by Mr. Corbet Woodall for this purpose takes a lot of strain off the crusher and elevator, reduces breakages, and saves power; it also sometimes does away with one attendant. The slow-moving belt-conveyor used by Mr. Herring answers a like purpose.

On the subject of elevators, Mr. Angus is the first engineer to go back to oak strips on the guides. These were introduced thirteen years ago by our mutual friend Mr. John Paul—a good old-style millwright. After a few years' trial, they were gradually superseded by hardened steel strips; but even if these lasted longer than wood, they took more lubrication, were noisy, and it was almost an impossibility to renew them. I agree with Mr. Angus in preferring wood—always assuming that diagonal joints are made. A friction driving-wheel is sometimes used, as well as one in the boot; and it works very well, acting as a factor of safety. Another good thing was introduced by Mr. J. H. Darby, of coke-oven fame. This was to put two or three weighted levers under the upgoing strand of chain, one end working inside the links freely when the elevator worked correctly, but in the event of a break (generally looked for near the head of the elevator), the levers came into use, and clipped the chain; thus keeping it from rushing down into the basement.

It is an old fallacy that elevators should run slowly. I prefer 150 feet per minute, as in this way smaller buckets and chains can be used. At (say) 80 feet per minute, much heavier chain must be used, and this puts greater weight on the skidders, and means heavier gear, shafting, &c. In America, the common speed is 200 to 300 feet per minute; but this is excessive when coal is irregularly fed into the boot. The secret of good work is a clear boot properly fed to three parts fill the buckets, quick speed at a good angle, and a quickly-clearing top shoot. Too much notice cannot be taken of the condemnation of bent elevators.

With regard to conveyors, an American some years ago said to me: "Your push-plate conveyors are a 'howling success.'" They are very convenient for distributing coal over a long hopper, but are too noisy, and take too much power. It is undoubtedly to band conveyors that attention ought to be given. In reality, they need less attention than a scraper conveyor. They can now be obtained with a throw-off carriage which travels backwards over any required distance, automatically, discharging all the time, so that the coal in the long hoppers is uniform. The band drives the carriage through friction-wheels, and the direction of travel is automatically reversed, by a stop raising a lever to just over the centre, when a falling weight jerks one friction-wheel out of gear and pulls in another. The driving friction-wheel can be put altogether out of action when the carriage needs to be at rest.

Band conveyors now are not what they were five years ago; and for this we have to thank an American, who reduced the building of these machines to a fine art. For smooth working on any cold substance, they cannot be beaten. It is a mistake to think they are best suited to grain. History proves that their province is in handling hard, lumpy, gritty materials, such as coke, ash, quartz, iron ore, and such like, which wear out steel conveyors in a month or two. The average life of a belt, handling 150 tons per hour at 400 feet per minute, is two years.

As to coke-conveyors, perhaps the least said about them the better, as everything depends on the situation, especially as regards the head room at disposal. Where this is not restricted, Mr. Hack's pan conveyor, with running rollers, as suggested by Mr. Hewitt, is, in my opinion, the best on the market; and I have seen every known form at work.

Continuous bucket coke-elevators are rightly condemned by Mr. Angus. They are the most costly from every point of view, and can only be regarded as coke-breakers. The coke-skip works well; but the present method of loading causes a lot of breeze when the hydraulic power forcibly closes the door at the collecting-pit. The skips should be loaded direct from the conveyor.

In gravity bucket conveyors we have another American pattern, but now in greater use over here than in the home of its inception. Any engineers who favour this type need not be deterred in adopting it by reason of its cost. It is not more costly than other designs (excepting the rubber belt type); and it is a marvel for easy running and huge capacity.

To convey from 40 to 100 tons per hour, the cost would be about £2 10s. to £3 per double foot (or per foot centres). It is usually adopted where both strands can be utilized; and the cost is then remarkably low. As to the trouble of breaking chains, in all my experience with coal and ash conveyors, I have not heard of such an occurrence on this type of conveyor.

Mr. Morris, of Nechells, very justly said the author in his paper gave the members in a few minutes knowledge which it might have taken them years to find out. I may say, in conclusion, I am not connected with any conveyor company, and so cannot be accused of "crying up the wares" of individuals.

ARCH. S. B. LITTLE.

28, *Shrewsbury Road, Forest Gate, E.*,
Oct. 18, 1906.

Free Gas for Demonstration Purposes.—The Southport ironmongers are taking further steps with the view of securing a larger share in the gas-stove trade than they have had for some time; and having decided to hold an exhibition of gas-fires in conjunction with the Gas Committee of the Corporation, they preferred a request that they should be supplied with gas free for demonstration purposes. At the last monthly meeting of the Town Council, the Gas Committee's consent to the application was confirmed.

LEGAL INTELLIGENCE.

AN IMPORTANT SLOT-METER CASE.

Magistrate's Extraordinary Ruling.

At the Old Street Police Court on Friday, before Mr. H. J. BIRON, Mr. R. Humphreys, of the firm of Messrs. C. O. Humphreys and Son, Solicitors for the Gaslight and Coke Company, appeared to support a summons against a workman named Rook, living at Barnsley Houses, Bethnal Green, for the non-payment of 3s. 10d. due to the Company for gas supplied. There were a batch of similar summonses, all turning upon the one point raised by the defendant—namely, whether he and they were liable for the deficiency in the slot-meter caused by a robbery from the box by some unknown person. The Company admitted that the robbery had taken place in several of these meters, and had endeavoured, but had failed, to trace the thief. In the first case, that against Rook, the shortage was found by the collector to be 3s. 10d.

Mr. HUMPHREYS was proceeding with formal proof of his case, when Mr. BIRON interposed with the observation: Once the money is put in the meter, the consumer has "paid" the Company. The money has really passed into the possession of the Company. They have got their money, and have been paid.

Mr. HUMPHREYS: The contract between the consumers and the Company, which is always signed before we put in the meter, distinctly says that "if the sum is found insufficient, the consumer shall pay the deficiency."

Mr. BIRON: That means where more gas has been burnt than the money represents.

Mr. HUMPHREYS: It meets a case of robbery, as well as a deficiency from any cause. [The Solicitor here put in the contract note signed by the defendant Rook.] He called attention to clauses bearing on the argument, Nos. 5, 6, and 7, as follows:—

> 5. The payment shall be made by the placing of pennies in the prepayment box attached to the meter for that purpose; and for the safe custody thereof the consumer shall be accountable to the Company until the money shall have been collected by the Company's officers and the official printed receipt in discharge given therefor.
>
> 6. In case of any defect or failure in the working of the automatic arrangement of the meter, or if from any cause the amount of the pence deposited in the prepayment box is found to be less than the sum which ought to be there, having regard to the quantity of gas registered by the index of the meter, the consumer shall be chargeable for the quantity registered by the meter.
>
> 7. If upon collection of the money in the prepayment box the same shall from any cause be found insufficient to provide the sum due, the consumer shall forthwith, on demand, pay the deficiency to the Company's officers.

Mr. BIRON: Supposing the man paid into the slot the full amount of money due, the sum demanded has been paid. It cannot be the Company's money unless it has passed into their possession. Unless you can show that this man himself—your customer—robbed the box, how can you recover the proceeds of the robbery? Your Company prosecute people who take their own money out of this box on the ground of theft. I do not think this man is liable.

Mr. HUMPHREYS: They have always been held to be liable. No. 6 clause was drawn up with the very view of meeting cases where the consumer does rob his own meter. Under Clause 5, the consumer is accountable to the Company until the money is collected.

Mr. BIRON: I do not think he is liable here, unless you can point me to some authority on this point which shows he is. Clause 6 says: "If from any cause," &c.

Mr. HUMPHREYS: That will cover a robbery.

Mr. BIRON: No, I think it is rather against you. Read on: "If from any cause the amount of pence deposited in the prepayment box is found to be less than the sum which ought to be there," &c. I think it is quite clear what these two clauses mean. They are intended to refer to cases when the amount of pennies does not correspond to what the meter shows ought to be there, because the man has not paid for the gas he has had. But in this case, the man has paid for the gas he has had.

Mr. HUMPHREYS: Except under our contract, we are helpless to say whether the man has taken the money or not.

Mr. BIRON: If you can show he has taken the money, you have your remedy. You cannot have it both ways.

Mr. HUMPHREYS: This man is really the caretaker of our money for the time being, under our contract.

Mr. BIRON: I cannot follow you there. He says he has paid you. I think you are reading into the clauses more than they are intended to convey. I should like defendant to satisfy me he has paid the money due.

Rook then gave evidence. He said that when the robbery was discovered, he told the caretaker of the buildings but did not tell the Gas Company.

Mr. BIRON: No doubt under Clause 3, you should have notified the Company.

> Clause 3 reads: In the event of any damage or injury occurring to the meter or fittings, or any defect being discovered which may hinder the proper working thereof, the consumer shall give immediate notice to the Company, and if such damage, injury, or defect be caused by any wilful act or default of the consumer, or his family or servants, the consumer shall pay to the Company the cost of making good or repairing the same.

Mr. HUMPHREYS said such a clause was necessary for the consumer's own protection as well as that of the Company. Returning to the point at issue, he called attention to paragraph 5—"The consumer shall be accountable to the Company until the money shall have been collected by the Company's officers." He held that this, when read in connection with paragraph 7 (above), applied to any case where there happened to be no money or insufficient money.

Mr. BIRON: If that is the case, you may sue him under paragraph 5. I could not make an order under the present summons.

Mr. HUMPHREYS: I must not press it, but you are the only Magistrate who has held that view up to now; and this kind of case has been decided as far back as 1896 by Mr. Baggallay. It was a case exactly on the same lines—there had been a robbery from the meter-box. Mr. Baggallay held the consumer to be liable.

Mr. BIRON: I agree that you may have some cause for action; but it is not a case for an order under this summons.

Mr. HUMPHREYS reminded the Court that, under the Gas-Works Clauses Act, the Company were empowered to come to that Court to recover the civil debt.

Mr. BIRON: You want me to order this man to pay 3s. 10d. robbed from his box and also the costs? I shall not make such an order. If you like to take your other remedy, I will consider it. I cannot make an order for payment.

Mr. HUMPHREYS: There are something like 220,000 of these contracts, which have always gone upon the supposition that they included cases of robbery. The contract form was drawn up with that very view. It was drawn up by Counsel who is now a Judge of the High Court. I cannot ask for a case to be stated, as I am in the invidious position of being on the wrong side.

Mr. BIRON: Your summons says "neglecting or refusing" to pay. But this man has neither refused nor neglected.

Mr. HUMPHREYS: We have made our demand, and he has refused.

Mr. BIRON: No, he has paid. And you want him to pay twice over because he has been robbed.

Mr. HUMPHREYS: Under our contract——

Mr. BIRON: Then you must sue him on the contract in the County Court. I will not help you. The man has paid once, and I do not see why he should be made to pay again. The Company can afford to lose the money much better than this poor man.

Mr. HUMPHREYS: That is a doctrine with which the shareholders will, I am afraid, not agree. You make no order then, Sir?

Mr. BIRON: No.

Mr. HUMPHREYS: The other cases are exactly on all-fours; and I had better not go on with them in view of your decision.

Mr. BIRON: If you want to raise a point of law there is nothing in the way of your asking for a case, as I dismiss the application.

Mr. HUMPHREYS asked for the rest of the cases to be adjourned *sine die* for the Company to have time to consider their course; and to this the Magistrate consented.

IPSWICH GAS COMPANY'S ASSESSMENT APPEAL.

The Question of Prepayment Meters, Stoves, and Fittings.

At the Ipswich Borough Quarter Sessions on Thursday last, the RECORDER (Mr. T. C. Blofield) gave judgment in the appeal of the Ipswich Gas Company against the valuation of their undertaking for rating purposes, the proceedings in which were reported in the "JOURNAL" for the 7th of August (p. 391).

The Counsel who appeared at the hearing of the case, were now represented by Mr. W. ROWLEY ELLISTON (instructed by Messrs. Notcutt and Son) for the appellants; and Mr. WALTER STEWART and Mr. JEEVES (instructed by Messrs. Vulliamy and Son) for the respondents.

The RECORDER, in giving judgment, said: This is an appeal by the Ipswich Gas Company against a poor-rate made on the 7th of May, in which the Company were rated for their works, plant, offices, mains, pipes, and other apparatus, in the parish of Ipswich, at a gross estimated rental of £17,681, and a rateable value of £6000; and the grounds of the appeal are that the Company are overrated as to both the gross and the rateable value, and that sufficient deduction has not been made from the gross to arrive at the rateable value. The case was heard by me on the 30th and 31st July last, and I reserved my decision. The Company both own and occupy the property rated; and, in accordance with the Parochial Assessment Act, 1836, I have to imagine a tenant from year to year, and to ascertain the rent he might reasonably be expected to pay for the property, under the conditions of the statute. I fix the gross estimated rental at £13,000, and the rateable value at £5200. The appeal will therefore be allowed, with costs. In arriving at the above figures—I mention this in consequence of what Mr. Avory said—I find the prepayment meters on the customers' premises to be provided by, and to be the property of, the hypothetical tenant; and I have taken them into account as part of the tenant's capital, in accordance with the case of *The Queen v. Lee*. I see no distinction in principle or in fact between the case of these prepayment meters and that of stoves and fittings similarly fixed on customers' premises. I find them, too, to have been provided by, and to be the property of, the hypothetical tenant; and I have taken them also into account as tenant's capital in arriving at the gross and net rentals. If either the prepayment meters or the stoves and fittings ought not to be taken into account, the appeal would have to be dismissed, with costs. As it is, the appeal is allowed, with costs.

Mr. STEWART: Upon that, Sir, your judgment is, of course, perfectly clear, with the exception of this circumstance—that you have founded your decision upon the inclusion of both the prepayment meters and the stoves and fittings. I would ask you, if you could see your way to do so, to intimate further whether, in the event of excluding the prepayment meters only, your decision would have been for the respondents; whether, if only stoves had been excluded, this would have been so; and, further, if fittings only had been excluded, this would have still been so.

The RECORDER: The stoves and fittings were not separated.

Mr. STEWART: They were only separated as shown in a valuation which was put in on behalf of the appellants by Mr. Ryde.

The RECORDER: But not on yours.

Mr. STEWART: Perhaps not; but they were separated in the schedule of Mr. Ryde, which schedule was before you.

The RECORDER: I have not the papers here. If you apply for a case, the question may arise then.

Mr. STEWART: As the judgment stands, it would necessitate the matter being sent back to you for an expression of opinion as to your view on this point. If that opinion were given now, it would save a step which must otherwise be taken later on.

The RECORDER: I have treated the stoves and fittings as they were treated by the valuers throughout, as being one and the same thing.

Mr. ELLISTON: I think, if I may be allowed to intervene, that it would be better for my learned friend to leave this until the case is settled, and then there will be no difficulty in getting at the fact with the definition that he requires.

The RECORDER: I cannot do it now.

Mr. ELLISTON: We shall not raise any difficulty when it comes to settling the case.

Mr. STEWART (to the Recorder): Then, if it should be necessary, you will be in a position, if the question were to be raised on that point of view, to inform the respondents as to whether, in the event of the exclusion of the stoves only, they would have been successful, and whether, in the event of the exclusion of the fittings only, they would also have been successful?

The RECORDER: Well, Mr. Stewart, I sincerely hope I shall hear no more of this case. I never had a more difficult case to deal with in my life. I have worked very hard at it, and I should be sorry to have to reopen it. If it is necessary, and I can do it from the papers I have, I will do it.

Mr. STEWART: And in the event of it being considered necessary by the Assessment Committee to go further, I would respectfully ask that you would state a case.

The RECORDER: I will, of course, state a case if it is required.

Mr. ELLISTON: And the costs will be taxed out of Court?

Mr. STEWART: Subject to just one observation. You will remember that, as a matter of fact, the respondents did, for the sake of peace and for saving the very heavy expense which is inseparable from having an appeal such as this, offer to reduce the assessment to £5500.

The RECORDER: I had no evidence of that. That was not stated in Court.

Mr. ELLISTON: I do not remember any evidence of that kind being given.

The RECORDER: It has never come to my knowledge.

Mr. STEWART: That was so; and I was going to ask that, under the circumstances, you would now exercise your discretion in favour of the respondents.

The RECORDER repeated that he had never heard the statement in question.

THE ALLEGED GAS-WORKS POLLUTION OF AN EDINBURGH BREWERY WELL.

A Further Adjournment Granted.

In the Court of Session in Edinburgh, on Tuesday last, Lord ARDWALL had before him the action by Messrs. James Muir and Son, Limited, against the Edinburgh and Leith Gas Commissioners, in which £10,000 is sued for as compensation for loss sustained by the pollution of a well in the pursuers' brewery. In June of last year Lord Ardwall, after proof, gave decree for £3730. The action was reclaimed by the Commissioners to the Inner House; and at the hearing there, in March last, the Gas Commissioners requested time to enable them to prove the ground. The Second Division accordingly sent the case back to Lord Ardwall, to have further evidence led, and with instructions that the additional proof was not to be taken before Oct. 16. Lord Ardwall fixed the date of proof for the 30th of October.

The LORD ADVOCATE, representing the Gas Commissioners, said his Lordship might remember that it was rather a curious action, because the case as alleged was substantially not proved.

Lord ARDWALL said he understood that the discussion in the Second Division proceeded upon the footing of there being three cases before them—pursuers' case, defenders' case, and his Lordship's case.

The LORD ADVOCATE said that was so. The Second Division allowed the pursuers to amend their case, by making a much broader and more comprehensive allegation, which required to be met by investigation in the strata between the gas-works and the brewery. Long before May 22, when the order for additional proof was made, the Gas Commissioners had started operations by boring in the ground. They had carried out operations of a very extensive kind; and he only wished that his Lordship had leisure to go and see what had been going on. A well had been put down at a point between the brewery and the works which were suspected. It had been sunk to a depth of 131 ft. 8 in.; and this level made it penetrate the pollution-bearing stratum altogether. But their advisers said that, in order to exclude any possible leakage being proved, they must have a mine driven immediately below the pollution-bearing stratum; and this was being done. The well had cost £323, and the mine, so far, £118. In order to keep matters right, every stage of the work had been intimated to the pursuers; and their representative had inspected the place. Therefore, to all intents and purposes, they had been carrying on a joint operation, in order to satisfy the Court. He was, however, sorry to say it was not completed, and would not be for some time. This was not their fault, because they had had three shifts of men working since March. There must be several months' delay before there could be a satisfactory issue to the case; and therefore he asked his Lordship to adjourn the diet of proof.

Mr. GUTHRIE, K.C., representing the pursuers, opposed the motion entirely. He said that the proof which had been allowed was a proof to the defenders; the pursuers did not wish any proof. They thought their case was complete, and that there could be only one result. The defenders would require to show some change of circumstances to justify them in asking for a postponement. He could understand, for instance, if they were able to say that they had found the strata to be different from what was expected—harder or more difficult to blast or bore. But, of course, they could not say that, because the nature of the strata was quite well ascertained before. Nothing new was alleged. The defenders' first proposal was to bore the ground; but this was abandoned, and they had sunk a well instead. Then, from this well, at a distance of 100 feet from the surface, they were in the course of driving a mine, which would go to a distance of about 230 feet. Already about 25 feet had been driven. The defenders were fishing about to find what they could. His friend had not given his Lordship the slightest idea when the investigations would be finished to the satisfaction of the Commissioners. The Gas Commissioners were in the position that claims had been intimated to them by other brewers; and the pursuers believed that they were making the investigations, not merely for this case, but also in connection with others. This was not justifiable; and his motion was that the proof should proceed. His information was that in sinking the well they employed only one shift; and that in driving the mine they were only using the hammer and chisel instead of blasting. In short, they wished to hang up the case, in the view that the pollution might tail-off. The most recent information, however, showed that the pollution was going on. If the defenders could get the matter prolonged, they might say that the pollution had ceased; and then they might attach the sum his Lordship had awarded.

Lord ARDWALL asked how far the mine had been driven, and when it would be completed.

The LORD ADVOCATE said the mine had already gone 35 feet. He did not admit that there had been any delay. He told them, frankly, that their action was not in view of any other claim. No other claims had been made; and there had not been one penny of expense which had not been strictly relevant to this particular case. He was told that it would require three months to complete the mine.

Lord ARDWALL thought there must be delay. It really came to be a question of difference upon fact, to some extent. He would give delay, because it would not be a very satisfactory thing to go to proof before the inquiry was completed; and the pursuers must remember that the allowance of proof was due to the faulty nature of their record. His own impression was that nothing would make much difference to the case; but he could not deny the defenders what they asked. The case was one involving a large sum of money. The Lord Advocate asked three months. He would give a little less. There was not much to be gained by taking it before the Christmas vacation. He fixed Jan. 8 and 9 for the proof—being the first and second days after the Christmas vacation.

An Account for Coal.

Lord Ardwall, in the Court of Session in Edinburgh, last Tuesday, closed the record in an action brought by Mr. Archibald Mackay, Gas Coal Merchant, of Edinburgh, against the Nairn Gas Company, Limited. Decree is asked for £78 10s. 2d., as due for coal supplied to the defenders in November, 1901, and April, 1902. The defenders say they believe the coal was sold to Mr. George Keillor, their Manager at the time, and that it was delivered at the Nairn Gas-Works. They aver that the pursuer agreed, at the request of Keillor, and without their knowledge or consent, not to invoice the coal to the defenders in the ordinary course of business, and did not do so; and that consequently the cost of it was not debited in the defenders' books, and was not included in their next annual balance-sheet, for the year ending March 31, 1902, but that subsequently the pursuer invoiced the coal to them, at dates in the years 1903 and 1904, by which time Keillor had ceased to be their Manager. They say there was a depletion of their stock, which could not have taken place without having been observed by them at the balance in 1902 if the account sued for had been before them then; but that in consequence of the pursuer's action, the alleged debt was not disclosed, nor claimed, until the dates upon the invoices. Their balance-sheets in 1902 and 1903 were framed in these circumstances; and they consider that they would be gravely prejudiced were they compelled to pay the pursuer the sum sued for. The case was sent to the roll for discussion upon the point of procedure.

The Ownership of Money in Slot Gas-Meters.

The Highgate Bench—Sir Francis Cory-Wright, Bart., in the chair—had before them on the 10th inst. a civil debt summons taken out by the North Middlesex Gas Company to recover 5s. 8d. for gas supplied to Mr. Anton, at No. 3, Flaxbourne Villas, Manor Park Road, East Finchley, and 3s. 6d. costs. Mr. A. M. Forbes, Solicitor for the Company, said the amount was small, but a very important point was raised, as the defendant, who had been a consumer of gas by a slot meter, had left the premises without giving notice to the Company, and the meter had been forced and rifled. The question was whether the payment into the meter was payment to the Company; and he contended it was not, because the consumer was negligent in not giving notice. The Chairman said he thought the defendant had been wrongly summoned. He was sued for gas supplied, and it was clear that he had to pay for it before he got it. Mr. Forbes submitted that defendant had not paid for it. He acknowledged that he had put the money into the meter; but it was all under his control. He contended that the defendant was in exactly the same position as an ordinary consumer. He had not paid the money to the Company. Suppose a consumer using an ordinary meter left the premises, and three months afterwards the meter showed that a number of cubic feet of gas had been used, he would be liable to pay for it. The Chairman said this was a totally different case. The defendant had to put the penny into the meter; and the Company would not let him have the gas unless he had done so. It was not his meter. If the Company chose to lock it up, and someone got the money out, it was the Company's fault. After further argument, evidence was given by the collector (Mr. J. W. Coleman) and the Chief Inspector (Mr. S. A. Carpenter) of the Company, and the case was adjourned for a week, to allow of the attendance of the defendant. On the resumption of the hearing last Wednesday, the summons was withdrawn, as there was no proof that the defendant had been served, and his present address was unknown.

MISCELLANEOUS NEWS.

THE DUNDEE GAS EXHIBITION.

As was stated in last week's "JOURNAL," an exhibition of gas appliances for cooking, heating, and lighting is being held under the auspices of the Lord Provost, Magistrates, and Town Council of Dundee, in the Drill Hall, West Bell Street, with cookery lectures and demonstrations by Miss E. M. Dods, the Principal of the Dundee School of Cookery.

An extensive and very pretty display is being made. Even outside, after dark, a great show is afforded by the lighting (which is in the hands of the James Keith and Blackman Company, Limited) with intensified gas, the compression being obtained by the use of a couple of water-motors. At the entrance-gates are a row of four lamps, containing clusters of fours, each lamp being of 1000-candle-power. These cast a great flood of light into the street, and illuminate the spacious esplanade which intervenes between it and the hall. Upon the front of the building are two single lamps, each of 600-candle power. From this it will be seen that the exterior lighting is of the most effective kind. The interior of the hall is darkened, which allows the lighting plant to be in use during the day as well as at night. What may be termed the public lighting of the interior is effected by a number of Welsbach self-intensifying lamps; but these are largely left unlit, it being found that the light from the stands gets a better chance thereby. There are seventeen stands, the general arrangement of which is a double row, back to back, down the centre, devoted to lighting exhibits, and a continuous row round the sides, upon which are shown cooking and heating apparatus—these also being brilliantly lit by one or other of the various forms of incandescent gas lighting. It is noteworthy that there is not a single flat-flame burner, nor fittings for flat-flame burners, in all the exhibition.

Taking the stands in their order, upon Nos. 1, 2, and 4, Messrs. Thomas Justice and Son, Limited, of Dundee, illustrate a bedroom, drawing-room, and kitchen lighted and heated by gas; the heating of the rooms being obtained by gas-fires placed in front of ordinary grates, not into them—it being a requirement of the Corporation of Dundee that all gas-fires must be so arranged, the ventilation going into the ordinary chimney. No. 3 is occupied by the Carron Company, whose principal exhibit is a serviceable-looking carving table, with meat recesses upon which there are elevating white metal covers, and recesses for soups, gravies, and vegetables. There is also a Carron patent egg-poacher, which poaches eggs and toasts and grills simultaneously; a grill and hot closet; a double gas-cooker; and other well-known wares of this old-established Company. No. 5 is the stand of the Richmond Gas Stove and Meter Company, Limited, whose speciality is their latest "Neptune" hot-water circulating boiler, intended to supply hot water for baths and other purposes when the kitchen-fire is not in use; their "Ilford" gas-fire, with gas and air adjuster; a "Tubal" greenhouse heater, which circulates hot water, the products of combustion being carried outside the building—a most efficient and cheaply-worked apparatus; and gas-steam radiators, one of which, with a consumption of 9 cubic feet of gas per hour, is capable of raising the temperature of 1750 cubic feet of air, and which takes the gas it requires automatically. The stand is a very effectively laid out one. No. 6 is a small gas-engine by the National Gas-Engine Company, Limited, consuming 5 cubic feet of gas per hour, and working a compressor which is used for the Sale and Onslow lighting appliances upon this stand and upon No. 7; the lamps (single mantles) giving a light of 800 candles each. No. 7 is a very handsome display of the high-class goods of Messrs. R. & A. Main, Limited. There are gas-steam radiators with safety valves and automatic regulators; a gas-fire fitted in front of a coal-grate; and a combination range, with two high-pressure boilers, both of which are heated by the coal-fire, but which, when the fire is off, can be made effective for supplying hot water by placing a moveable gas-burner under the upper of the two boilers.

No. 8 is the stand of Messrs. Fletcher, Russell, and Co., Limited, who show a gas-heated steam radiator, with automatic arrangement for maintaining steam at 1 lb. pressure, suitable for use in greenhouses and other places in which it is not desirable to have gas-fumes retained. On stand No. 9 are shown the goods of Messrs. Parkinson and W. & B. Cowan, Limited, consisting of porcelain enamelled gas-fires, enamelled cookers, grills, and hot plates, with ingenious arrangements for working, and models of gas-governors, and wet and dry ordinary and prepayment meters. The exhibit is an extensive and highly interesting one. No. 10 is the stand of Messrs. John Wright and Eagle Range, Limited. They exhibit a gas-heated high-pressure boiler, working automatically, which may be used in conjunction with an existing coal-range and water-pipes—an appliance which has much to recommend it; the "Wizard" fire, a highly efficient gas-fire with single ball fuel, costing little, and adapted for use with prepayment meters; a number of "Eureka" cookers; and two suites of fire-places, with mantels, of beautiful design and workmanship. Messrs. Falk, Stadelmann, and Co., Limited, on stand No. 11, have a brilliant display of lighting appliances, including the "Lucet" light, in which the mantle is hung between two supporting rods; a "Vesta" 110-candle power inverted burner, consuming about 4 cubic feet of gas per hour; and numerous burners with "Veritas" mantles.

Messrs. J. & W. B. Smith, of London, have a strong exhibit, at No. 12, in "Glasmi" mantles, and lamps for indoor and outdoor lighting. At No. 13, Messrs. James Milne and Son, Limited, besides many graceful gas-fittings, and "Humphrey" lights—one of four burners, consuming 14 cubic feet of gas per hour, and giving a light of 550 candles—have on view Macfie's patent governor-meter; King's pressure-gauges; O'Connor's leakage indicator; and Milne's pressure-recorder, all of which are well-known apparatus. No. 14 is the stand of the Welsbach Incandescent Gaslight Company, Limited. Lighting by the mantles and burners of the Company, including an intensifying single-mantle lamp of 600-candle power, consuming 17 cubic feet of gas per hour, and heating by Kern radiators, are shown. At No. 15, Messrs. R. Laidlaw and Son, Limited, make a fine show of prepayment meters, gauges, test meter, and outside lamps; the latter including the copper lanterns which are being supplied to the Corporations of Edinburgh, Glasgow, and other large towns, for use with inverted burners. Messrs. Alder and Mackay, of Edinburgh, at No. 16, have a display of meters, and among others a specimen of a prepayment meter of which there are 8000 fixed in Newcastle, and many in other towns; a demonstration meter, illustrating the difference between the quantities of gas consumed by flat-flame and incandescent burners respectively; a case containing the different materials used in the construction of meters; and several lanterns in which are shown at work the firm's appliance for lighting and extinguishing gas-lamps from a distance by the raising of the pressure of the gas, of which there are several installations satisfactorily at work. The last stand is occupied by the Dundee Gas Commissioners, whose exhibit is a plan of the works and a diagram of the retort-settings, displayed on the wall, with, in front, an arrangement, in three tiers, of the materials used in the manufacture of gas, the secondary products recovered, and coal-tar derivatives.

The exhibition is receiving a large amount of attention from the citizens; and gas managers from other towns are finding it a convenient means of seeing, by comparison, the merits of the latest appliances in the market for the consumption of gas.

It may be mentioned that the Dundee Gas Commissioners supply and fix free of charge gas-cookers, hot-plates, grillers, and boiling-rings; and that they sell and fix free gas-fires, heating-stoves, radiators, and condensing stoves. Mr. Alex. Yuill, the Engineer, deserves the highest credit for the organization of the exhibition.

THE GASLIGHT AND COKE COMPANY AND THE GAS-STOVE MAKERS.

The Supply of Sample Stoves.

As the outcome of the several meetings, held under the auspices of the Society of British Gas Industries, between the representatives of the gas-stove makers and Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company, an arrangement has been made with regard to supplying sample stoves to ironmongers co-operating under the scheme of which we gave particulars in the "JOURNAL" for the 31st of July last (p. 332). Mr. Goodenough has forwarded to the "Ironmonger" a copy of the memorandum of arrangements which will enable the Company to supply to the ironmongers co-operating with them sample stoves (for show purposes only) at 50 per cent. off the manufacturers' list-prices. The manufacturers as a body took up the position that they could not possibly afford to supply the ironmongers with stoves on sale or return; and in order to avoid a general scramble for the various ironmongers' patronage, the manufacturers requested the Company to undertake the task of giving each manufacturer a fair share of the business when arranging with the ironmongers as to what stoves they would put on show. The manufacturers have agreed that they will supply no goods on sale or return to any of the co-operating ironmongers, will not canvass them in respect of the choice of goods for show, nor do any trade with them in gas goods except through the Company. The Company will, it is understood, disturb as little as possible the business relationships that may already exist between the individual ironmongers and various firms of stove manufacturers.

LOCOMOTIVES AND WAGGONS IN FACTORIES.

The New Home Office Regulations.

In the number of the "JOURNAL" for the 2nd inst. (p. 48), we noticed the report of Mr. Chester Jones, of the Middle Temple, the Commissioner appointed to inquire into the regulations proposed by the Home Office in regard to the use of locomotives and waggons on lines and sidings in, or in connection with, premises under the Factory and Workshop Act, and gave the Draft Regulations. These have now been printed in placard and pamphlet form for posting on the works or use in the office. They embody the modifications in the original draft agreed upon during the course of the inquiry between the Home Office and the objectors, with the omission of Regulation 1, dealing with the distance between lines of rails or between a line of rails and a fixed structure, and Regulation 6, dealing with dangerous level crossings. The Secretary of State agrees with the conclusion of the Commissioner that in their present shape these two regulations would not satisfactorily meet the dangers at which they are aimed. The reservations which it has been found necessary to introduce into the original draft, and the wide choice of measures which has had to be allowed, in order to cover the great variety of circumstances existing in the places to which the regulations would apply, would, he thinks, make it extremely difficult, if not impossible, for the Department to secure in many cases the improvements which are required. The inquiry has, in fact, shown that it is impracticable, on these particular subjects, to frame a single definite provision which will meet satisfactorily the requirements in each class of case. The Secretary of State has decided, therefore, to omit these two regulations, and to instruct the Factory Inspectors to take the matter up, and deal with the dangers arising in connection with adjacent lines of rails, fixed structures, and level crossings, by administrative action under their existing powers—having recourse, if necessary, in any particular case, to the power of obtaining an order under section 17 of the Factory and Workshop Act, which provides that a Court, on being satisfied that any part of the ways, works, machinery, or plant in a factory is in such a condition that it cannot be used without danger to life or limb, may make an order prohibiting its use. The Secretary

of State expects that occupiers will now take the measures necessary at their works to prevent the dangers in question; and he states that special reports will be called for later from the Inspectors as to the progress which has been effected in making the necessary improvements. As has been already mentioned, the new regulations (except Nos. 1, 2, and 22) will come into force on Jan. 1, 1907; the three specified, on Jan. 1, 1908.

DANISH GAS COMPANY.

Annual Report and Accounts—The Company to Supply Water.

At the Annual General Meeting of the Danish Gas Company next Tuesday, the Directors will report that the net revenue for the year ending the 30th of June last was £65,080; being an increase of £11,261 on that of the preceding year. Adding the amount brought forward, the total sum standing to the credit of the profit and loss account is £91,463. After providing for the payment of interest on the debenture capital, &c., transferring £10,000 to the depreciation account and £1000 to the reserve account, there remains £69,405 available for distribution. An interim dividend of 2½ per cent. on the preference and 4 per cent. on the ordinary shares has already been paid; and the Directors recommend that there should be declared a further dividend of 2½ per cent. on the former and 5 per cent. on the latter shares. These dividends amount together to £36,500, and will leave a balance of £32,905 to be carried forward. The net amount charged to capital account during the year for additional buildings, apparatus, mains, services, and meters was £16,153. To provide capital for the further extensions of works, &c., rendered necessary by the increasing business of the Company, the Directors have decided to issue, as from the 1st of January next, to the holders of ordinary shares, an additional 5000 5 per cent. preference shares of £10 each, at par. A Committee of the Directors visited Denmark in the early part of October, and found the works in good order and the business prospering. The Directors report that they are at present negotiating with various Local Authorities for concessions to supply gas and water to the inhabitants of certain districts in the neighbourhood of the Company's works at Elsinore and the Strandvei. In view of the Company undertaking the supply of water, it is proposed to amend the statutes to include this business. For this purpose an extraordinary meeting will be held, immediately after the ordinary meeting, to consider the necessary alterations.

The Company's Engineer (Mr. A. W. Edwards) reports that the total consumption of gas in the twelve months covered by the accounts was 952,518,000 cubic feet; being an increase of 61,478,000 cubic feet, or 6·9 per cent., as compared with the preceding year. The demand for coke and tar is satisfactory. With regard to the works, a gasholder has been erected on the new ground acquired at Flensburg; and it will be taken into use in the coming winter. At Odense, a new retort-house is being built, and it will be possible to produce gas in it in a short time. The enlarged lunatic asylum at Viborg being now entirely lighted by gas, there has been a considerable increase in the sales in the town. Though an electricity station has been built by the Commune of Randers, and will be started this autumn, all the public lamps are being fitted with incandescent gas-burners. The extension and remodelling of the works at Assens have been completed, and the plant is working satisfactorily. At Frederiksberg, a new retort-house and coal-store are being erected, and they will be available for use next winter. In addition, the sulphate works and the boiler plant are being extended; and one of the gasholders has been enlarged. Mr. Edwards reports that all the Company's stations will be in good working order for the ensuing winter.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards, resumed his sales of gas and water stocks and shares. Two new issues of capital were offered on behalf of Directors. The first consisted of £3000 of consolidated ordinary stock of the Chigwell, Loughton, and Woodford Gas Company; and it was all sold at £108 to £110 per £100 of stock. The other new issue was 400 ordinary £10 shares in the Lowestoft Water and Gas Company (last dividend 5¾ per cent.), which fetched £10 10s. to £11 each; also £1000 of 4 per cent. perpetual debenture stock of the same Company, all of which was sold at from £105 to £106 per £100. Some original "A" stock of the Northfleet and Greenhithe Gas Company (last dividend 9 per cent. per annum) was sold at £150 to £153 per £100; and some 3½ per cent. bonds fetched from £75 to £77 per £100. A parcel of £10 fully-paid new ordinary shares in the Southend Water Company, carrying 5 per cent. dividend from the 1st of July last, realized £10 15s. each. A few £10 "E" preference shares (5 per cent.) in the Aldershot Gas and Water Company fetched £11 15s. to £12 per share *cum div.* as from the 1st of July. In response to the invitation of the Directors of the Croydon Gas Company, tenders were submitted for the issue of £20,000 of "D" (5 per cent.) stock, and were opened last Wednesday. The whole of the stock was allotted at prices ranging from the minimum of £107 to £112 per £100; the average price obtained being £108 6s. 7d. Applicants at the lower price received 25 per cent. of the respective amounts applied for. On the same day, Messrs. Pendered and Son sold three original £35 shares in the Wellingborough Gas Company—one at £66, and the others at £65 17s. 6d.

Imperial Continental Gas Association.—At the next half-yearly meeting of the Association, the Directors will recommend a dividend of 4 per cent., free of tax, for the six months ending the 30th of June.

Gas Profits at Pontypridd.—The balance-sheet of the Pontypridd Gas-Works shows that the gross profit on the past year's working was £4725; the receipts having amounted to £18,267, and the expenditure to £13,542. A sum of £1091 has been allocated to the relief of the general district rate.

THE NOTTINGHAM GAS CONTROVERSY.

Our Nottingham correspondent writes: During the past week, meetings in Nottingham in support of rival municipal candidates have been prolific of speeches bearing upon questions affecting the management of the Corporation gas undertaking. As was expected by those enabled to properly estimate the situation, the hope expressed at the Council meeting on the 1st inst., that the last had been heard of the question, at any rate for a time, has been entirely unrealized. The demand on one side for the publication of the evidence given before the Special Committee presided over by Alderman Sir John Turney is met by the display of almost feverish anxiety that nothing should be allowed to leak out. In the latter connection, however, there are to be found none who desire that the principle underlying an old aphorism which has relation to hearing both sides should be respected in this case, or in others, where questions of high principle in relation to the control of municipal undertakings are involved. The difficulty obviously is as to possible consequences of proceedings for libel if testimony given under implied arrangement as to confidence is made public property; and, upon this head, a suggestion is forthcoming from one who has taken part in the discussion that this obstacle might be surmounted if an indemnity as to subsequent proceedings were given previous to making the evidence public. Although it was possibly with the best intention in the world that the Committee of Investigation was appointed, upon terms the nature of which has already been made known, the feeling grows that it was a great mistake not to have had a public investigation. The means adopted have defeated the very object aimed at, as the demand of ratepayers who are not swayed by party prejudice now appears to be getting very general that the citizens should be allowed to know the truth. It is not without interest to observe that, while there is in the course of the municipal campaign a good deal of harping on the old topic of good *versus* bad gas, the case for the Engineer appears to be strengthened daily in the view of a discriminating section of the inhabitants. It is recognized that whatever, if any, the faults of management may have been, they can be only adequately determined by the technically trained mind. As freely also is it being admitted by correspondents to the local papers that, if suggestions made by the Engineer to many large consumers had been acted upon at an earlier date, much unnecessary trouble might have been avoided. Inferentially—during the past few days—some members who resigned their positions on the Committee have come in for a little mild criticism. At a meeting in one of the wards in support of the candidature of Major Ashworth, who has been acting during the last few months as practically the Chairman of the Committee, that gentleman was referred to by an ex-Sheriff of the City as the man who stopped on the bridge when the captain left the ship.

Of the alleged undue allowance by way of reduction upon official charges made for gas consumed by a local company, much has been heard during the last few days; but, although in a way important, this matter figuratively speaking constitutes but a small drop in the ocean upon which the controversy surges. By far the most serious aspect of the whole matter is the Trades Union element in its bearing upon the conditions affecting the management of a great municipal undertaking. Whatever may have been divulged in confidence before the Special Committee, it is a matter of public property that at one of the Trade Council meetings, representative of various sections of allied workers, there was open rejoicing over the fact that the Gas Engineer had been brought to a sense of his position, and that terms for which the Trade Union leaders had striven had been conceded to the workers. In this connection, it is not without its significance to note that the principal gas-works at Basford are in the Ward represented in the Council by the late Chairman of the Gas Committee (Mr. E. Harlow), and that the employees engaged at the works form no inconsiderable section of the voters within this area. The truth of the whole matter is that there is so much jerrymandering in Nottingham that the Trades Union element is rapidly becoming predominant; and, under the conditions which obtain, professional perspicacity in relation to the judicious management of municipal undertakings is rapidly becoming a valueless factor. Nottingham's case probably is not isolated in this respect; but it would be difficult up and down the country to find a more glaring illustration. The unfortunate part of the whole thing is that, under the circumstances, some of the better class of business men, when invited to stand for municipal positions, will not come out to be shot at. The result is that in numerous instances men who never had a commercial concern of any size of their own to manage, secure places in which they are enabled to spend thousands of pounds of the ratepayers' money, often upon schemes which, when tested by the standard of general utility, would be found to be entirely wanting. If the Nottingham Gas Engineer is to suffer under such circumstances, the question arises whether the evil may not spread, to the disadvantage, not only of the general bodies of ratepayers, but to the members of a profession calling for the exercise of the highest technical skill. The Special Committee appointed to deal with the Nottingham case does not in itself fall within the purview of these observations. It constituted a body of business men of trained capacity; but they were entirely powerless in contrast with the larger number forming the political and Trades Union preponderating majority in the Council. The report therefore was necessarily an opportunist document of the most obvious character.

A declaration made at a meeting of the Nottingham Trades Council held on Wednesday last by Mr. W. A. Appleton, the principal among Trades Union leaders in the city, had reference to an intention to establish new classes at the People's College for affording instruction in economics, among other subjects. The hope of many large ratepayers is that the curriculum may be made comprehensive in the sense of embracing municipal and economical considerations in relation to local affairs. At the meeting referred to, Mr. Wiliams, who is to conduct the special class, assured his hearers that it was generally recognized that the democracy for the future was going to rule the country; and it was therefore absolutely necessary that the leaders of the democracy should be well informed. There was no especial reference to the gas question; but it is none the less a curious commentary upon

the zealous demand for wider knowledge that it should be limited to generalities which do not conflict with partisan or Trade Union interests. An article which appeared in the "JOURNAL" for Sept. 25 (p. 817) dealing with "Engineering and the Workman" has been brought into some prominence during recent municipal meetings in the city; and though it is never safe to prophesy, the First of November contests in Nottingham may yield some results that may rudely upset preconceived wishes.

Dr. Milner, who has seen six years' service on the Nottingham Gas Committee, had something to say with regard to the recent troubles when addressing an election meeting last Tuesday. He remarked that some five years ago he had seen in what way the gas undertaking was going to "pan out." In his opinion, the present gas trouble had its origin long before the present Engineer, Mr. J. H. Brown, had been appointed. The trouble had arisen since the death of the late Manager, Mr. W. R. Chester, when the gas undertaking was left for nine months without a Manager. When the present Engineer took charge of the works, they were in a very bad condition. Now they were to be satisfied with the results of the special report; but he personally was not. It was voted upon in the midst of so much confusion that the votes were practically taken when very few people knew whether they were voting for or against. It was obvious that the thing was misunderstood. He thought the charges made against the Engineer by certain gentlemen gave Mr. Brown a right to be heard. He could promise that in a short time there would be very little complaint against the management of the gas. The key-note of all the friction was that no man could serve two masters.

Mr. R. Sands, one of the three members of the Gas Committee who resigned some time ago, addressing a meeting in favour of a candidate for the Council, alluded to the gas question. Recalling the circumstances under which the trouble had first arisen, he stated that there had been complaints from all quarters during the last two or three years as to the gas, and the general management of the undertaking. Some six months ago three members of the Council—of which number he was one—came to the conclusion that for the proper remedying of the existing defects it was necessary that they should have a new Manager. Not obtaining the support of the Committee for this view, they tendered their resignations as members of the Committee; and at a later stage statements were made to the City Council giving reasons for their resignations. Arising out of this action, a Special Committee was appointed to inquire into the working of the undertaking; and the three members who had resigned were invited to appear before the Committee and give any explanations they wished. They attended, and gave some further particulars of the reasons which had led them to take the step they did. The Gas Engineer also appeared before the Committee, and gave his version of the affair. It was stated to them, when they gave their evidence, that what they said was confidential and privileged. The Gas Engineer, in the course of his statement, made some comments with regard to the conduct of Mr. Harlow and himself (Mr. Sands) which, if they had been made public, would have rendered the person making them liable to an action for slander; but, inasmuch as they were privileged, no action could be taken with regard to them. The reason why the evidence could not be published was that the party publishing it would be publishing a libel, and would be liable to an action for libel. The gentlemen who made the statements would not be liable, because he was privileged; but those publishing them would be liable. The result was that members of the Council were debarred from publishing the evidence given, because they would render themselves liable to an action.

Speaking at a subsequent meeting, Mr. B. S. Wright mentioned the gas question as being a case in which a stronger Conservative minority in the Council would have been of considerable value. Mr. Sands had said that in his evidence before the Investigation Committee the Gas Engineer had made certain accusations which were libellous, and which, if repeated in public, would result in an action for slander on behalf of himself (Mr. Sands) and other late members of the Gas Committee. To suggest that these statements were libellous, as Mr. Sands did, was to suggest that they were untrue. Mr. Sands did, in fact, say they were untrue, and that he could easily rebut them if they were made public. The Committee of Investigation—consisting mainly of Liberal members—did not censure the Engineer; and so presumably they believed the statements made by him concerning the retiring members of the Gas Committee. Until they got a stronger minority in the Council, they would always be liable to doubts and mysteries of this kind, which never ought to have happened in the Council of a city like Nottingham.

The Gas Poisoning Case at Acton.

From the evidence given at the inquest on the bodies of Mrs. Keysell (aged 75) and her daughter (aged 53), whose deaths occurred at Acton under circumstances briefly recorded in last week's "JOURNAL" (p. 189), it appeared that the escape of gas which was the cause of the fatality arose from a water-slide chandelier. The ladies were found dead in their dining-room; and the doctor stated that their positions were natural, and there was no sign of a struggle. A gas-fitter named Draisey, who fixed the chandelier when the deceased moved to Acton quite recently, stated that he could not test it, as the gas was not then laid on. The slide was, however, left filled with water, which would take years to evaporate. When the meter was connected to the gas supply, there was no movement of the register, and so it was thought that there could be no leakage. It was possible that there might be a leakage from the ball-and-socket joint. An official from the Brentford Gas Company, on the other hand, said that, when the chandelier was examined, gas was found to be bubbling through the water. The Coroner emphasized the fact that the fittings were not tested after the gas was lit; and the Jury, in returning a verdict of "Accidental death," added a rider that the fitter who had connected the meter with the supply to the house should have examined the fittings, and should be severely censured for not having done so.

STREET LIGHTING IN LIVERPOOL.

At the final meeting of the Liverpool Lighting Sub-Committee for the present municipal year, Mr. W. W. Walker, the Chairman, in reply to a vote of thanks, referred to the work done by the Committee during the past twelve months.

He said that 4¼ miles of new streets had been lighted by means of 117 single incandescent gas-lamps. The rearrangement and improvement of the lighting carried out in the old streets involved the erection of 4 double and 33 single incandescent gas-lamps, the removal of 119 to new positions, the substitution of 16 columns in lieu of brackets, and 9 brackets in lieu of columns, and 31 new columns in place of broken ones. The work in regard to passage lighting had been limited to the erection of 100 2-feet burner lamps. The daily testing of the gas at the Central Office indicated an average for the year of 20·60 candles; while those on the district averaged 20·39 candles, against the parliamentary standard of 20 candles. During the year 425 tests had been made in the office, the average of which indicated that the limitations placed on the amount of sulphur compounds in the gas had not been exceeded; while 2043 visits paid to the seven pressure-testing stations throughout the city gave satisfactory evidence of equitable distribution. As to meter testing, 10,734 gas-meters had been tested, representing an increase of 13 per cent. on the previous year, which was a record one. Of these, 766, or 7 per cent., were rejected. Of electricity meters, 3039 were tested, and 1085, or 35 per cent., rejected. The whole of the gas-fitting work in municipal establishments had been, as heretofore, carried out by the department, a revenue of £2274 being derived from it. The city at present was lighted by means of 18,765 lamps, made up as follows: Electric arc 188, ditto incandescent 82; 4 and 3 light incandescent gas 69, 2-light ditto 1989, 1-light ditto (full time) 7749; 1-light ditto (extinguished at midnight) 4122; and court and passage 4-feet lamps 1623, 2-feet lamps 2943. To deal with the lighting of these lamps, 182 men had been employed under the supervision of 14 foremen; while the entire work of maintenance of the columns and lamps had been carried out by 77 inspectors, mechanics, &c. The necessary Provisional Order for the erection of works for supplying with gas the township of Fazakerley had been obtained, and the necessary land for the site of the works purchased, and Mr. Isaac Carr, the Engineer to the Widnes Corporation Gas and Water Works, had been instructed to prepare plans and specifications for the buildings, plant, &c.

A GAS-WORKS LOAN FOR LEEDS.

Capital and Revenue Charges.

Colonel W. R. Slacke recently held an inquiry, on behalf of the Local Government Board, with reference to an application by the Leeds City Council for sanction to borrow (among other amounts) £50,000 for gas-works purposes.

It was explained by the Town Clerk (Mr. R. E. Fox) that the money was for mains and meters. This was one of the usual applications for sanction to meet the ordinary expenditure in these respects. As new property arose, mains and meters had, of course, to be provided; and it was a recognized principle that this work should be provided out of capital. The sum now asked for was for three years. The Inspector said it would be necessary to separate the cost of labour from the cost of material, as a new rule of the Local Government Board was that the cost of employing permanent workmen must come out of revenue.

Mr. Dransfield, who appeared on behalf of the Ratepayers' Association, said they did not oppose the sanction for borrowing any money that had been spent on the gas-works illegally—that was, without borrowing powers having first been obtained—but they opposed tooth and nail all the Corporation asked for in addition. The Town Clerk remarked that none of the money had been spent; but Mr. Dransfield, quoting from the Corporation accounts, said £23,008 had been expended for which borrowing powers were required. He added that the works that would be carried out were not such as would be sanctioned by the Local Government Board. Financially the city was in such a state, and the citizens were so intolerably burdened with rates, that the Association opposed further outlay. The Inspector pointed out that this would mean that gas was not to be extended to the new streets; but Mr. Dransfield said this was not his contention. The Corporation should take out the meters from the 8000 empty houses in the city, and put them in the new ones.

LLANDUDNO GAS AND WATER WORKS.

A report has been submitted to the Llandudno Urban District Council by Mr. Walter Wood, their Accountant, dealing with the financial results of the various undertakings for the fifteen months to March 31. The total income of the gas-works came to £17,307, of which £10,835 was from the sale of gas to private consumers. To realize this income, an expenditure of £9348 was required; leaving a gross profit of £7959. After deducting the charges of £5118 for interest and redemption of loans, &c., there was a net surplus of £2841, which has been appropriated as follows: To meet the deficiency on the water fund, £1827; to the water and gas depreciation fund £500; to the gas-cooker depreciation fund, £380; and carried forward, £134. The consumption of gas by private consumers decreased by 485,000 cubic feet, which represented a reduction in sales of £76; but the expenditure on coal was less by £200. An increase of £317 occurred in the income from prepayment meters. The revenue in the Water Department was £8419, and the expenditure £2098; the gross profit amounting to £6321. But as the loan charges and redemption came to £8148, there was a deficiency on the water fund of £1827, which, as already mentioned, was met by a contribution from the gas-works profits.

GAS AND WATER WORKS FOR BAHIA BLANCA.

In the issue of the "Buenos Ayres Standard" dated the 23rd ult. there was an interview with Mr. A. Gibson, Gas Engineer, who had just returned from a visit to Bahia Blanca—as to the future of which place he holds optimistic views. It is, he says, growing with surprising rapidity, its commerce is extending, the country behind it is mostly a fertile grain-producing region, and there seems to be every prospect of the city becoming one of the largest and most prosperous business centres in the Argentine Republic.

Under these circumstances, of course, a plentiful supply of water, gas, and electricity, together with good sanitation, becomes of the very greatest importance; and we learn that active steps are being taken to provide them. A convenient site has been acquired for the erection of the gas-works, midway between the city of Bahia Blanca and the port town of Ingeniero White, close to the line of the Great Southern Railway; so that a siding therefrom can deliver the coal from the railway waggons to the works. It is hoped to have everything in readiness for the manufacture and distribution of gas in less than twelve months' time. The Pacific Railway Company have commenced the erection of a large plant for electric power supply and lighting purposes. This will greatly improve the existing establishment, which has become altogether inadequate to the present wants of Bahia Blanca. The water scheme, which is being carried out jointly by the Great Southarn and Pacific Railway Companies, is a big undertaking, as it comprises the bringing of water, by means of 18-inch cast-iron main pipes, from a spring in the Sierra de la Ventana to a distributing reservoir, situated some 20 kilometres from Bahia Blanca; and from this point an ample supply of good, clear water will be conveyed to all parts of the city. A very large sum of money will be invested in the works. A complete system of drainage is also to be carried out.

MORE PROGRESSIVE EXTRAVAGANCE.

The special representative of the "Pall Mall Gazette" who has been looking into the affairs of the Metropolitan Boroughs, in view of the forthcoming municipal elections, and whose revelations in regard to Islington were noticed in the "JOURNAL" a short time ago, lately turned his attention to the neighbouring borough of St. Pancras, and has shown up some of the follies perpetrated by the Progressives. Despite the fact that the rateable value is close upon two millions sterling (about £8 per head of the population), and that one-fourth of the area consists of railways and semi-public open spaces—the former a very valuable source of revenue, and both demanding little municipal attention—the Progressive majority has not only maintained the high rate of 7s. 1d. in the pound, but, according to the estimated expenditure for the next half year, is actually increasing it by 2d. One of the departments is that having charge of the electric lighting; and in regard to this our contemporary's representative says the undertaking has been made to show a profit by "the usual methods employed in municipal trading." But the cost per mile for public lighting works out by this remarkable profit-making system at the astonishing figure of £247, which may be compared with the charge in Camberwell, where the work is at present performed by a company for £90 a mile. In spite, however, of making the profits out of the ratepayers' pockets, things have been going very badly for the St. Pancras undertaking during the past three years; even the "paper" profits falling from £20,583 in 1903-4 to £13,098 in 1904-5, and to the still lower figure of £9441 in 1905-6. The following is the statement of income and expenditure on revenue account for the year ended March last, compared with that for the previous year:—

	1904–5.		1905–6.
Income	£68,459	..	£72,087
Expenditure	33,592	..	39,235
	£34,867	..	£32,852
Loan charges and bad debts	21,769	..	23,411
Net profit	£13,098	..	£9,441

Thus, while £3628 represented the increase in income, the rise in expenditure was £5643, and that in loan charges and bad debts £1642. With one exception, St. Pancras has the largest outstanding loan of any of the London Boroughs; it being as high as £823,000.

On the other side of the water, the "keep dark" policy seems to prevail. "The most serious difficulty we have in Southwark," said a member of the Borough Council, discussing the municipal position in the borough with the representative referred to, is to get information. "Formerly, by giving 24 hours' notice, any member of the Council could get what facts he wanted. But the Progressives, finding it inconvenient to answer inquiries with regard to their policy, decided that any question involving a return should not be answered without the consent of the whole Council; so that whenever we ask awkward questions, the Progressives being in the majority, the consent of the Council is withheld. However, there are certain things that are common knowledge. The electric lighting in Newington, for example, is a ghastly failure. The Council claim a profit of £300. But how is it made? I will give you an example. For opposing the Electric Power Bill in Parliament—a Bill which, if it had come into force, would, their Counsel argued, have ruined the municipal undertaking—the costs were £800. But not a farthing of these costs was charged to the electric lighting account; they were all charged against the general rates. Of course, had they been charged correctly, they would have swallowed the so-called profits for three years. It is also a fact that the electric lighting undertaking is most grossly under-assessed; for although the capital expenditure in the first place was only half what it is now, the original assessment has never been altered. While, therefore, the Council never miss an opportunity of assessing private manufacturers' machinery, they fail to assess their own." This is an excellent way of showing profit.

WATER UNDERTAKINGS AND FIRE EXTINCTION.

A Report by Mr. James Watson.

Owing to the fact that the water supply has been found inadequate to deal with recent outbreaks of fire in Idle and Bierley, which are out-districts of the Bradford Corporation Department, a question has been raised in regard to the responsibility of municipal authorities to supply water for fire extinction purposes. As a result of this, the Engineer, Mr. James Watson, has presented a report on the subject to the Water Committee, who, after considering it, have come to the conclusion that it is no part of the duty of water undertakings to lay special mains for fire extinguishing. Mr. Watson opens his report with particulars of the water supply of Idle and Bierley; and the subsequent portion contains the following remarks.

Before dealing with the supply of water for extinguishing fires, it may be well to state that property in Bradford does not now, and has not for long, contributed one penny towards the expenditure on water-works matters. The Bradford Corporation Water Acts provide for levying a public or general rate of 3d. per pound, which would apply to the whole rental of the city, and produce £17,000 per annum; but the Corporation decline to levy such a rate, and during the last fifteen years, with one exception—1897-8, when a rate of 2d. in the pound was laid—no such rate has been charged. Water supply is not a tax, nor are "rents" "rates." No charge can be made for water unless that all-important commodity is supplied; and everyone is free to take it or leave it. He who does not take it, makes no contribution to the water revenue. Therefore a water supply *pro bono publico*, for public purposes such as fire extinguishing, &c., is a matter where considerations other than those which apply to domestic use are demanded.

In the city of Bradford there are 227 miles of public roads and streets, in and under which we have 340 miles of pipes from 36 inches to 3 inches diameter, and in addition many miles of private roads and streets, with 2½-inch, 2-inch, and 1¼-inch pipes. In many such roads and streets the service water-pipes are 3 and 4 inches in diameter, fed at one or both ends by larger mains; and such sizes are sufficient to give a constant and abundant supply of water for domestic and ordinary non-domestic purposes to all the people who pay for it. It does not, however, follow that fire cocks attached to a 4-inch or 3-inch pipe afford sufficient provision for coping with a fire, unless the fire is caught in its early stages, because from such pipes only one line of hose can be efficiently supplied. If property throughout the city of Bradford, including the recently annexed districts, has to be efficiently protected in every road and street by fire-mains competent to deliver (say) 1000 gallons of water per minute at the fire-cocks, then many miles of mains 6 inches in diameter and over should be laid down.

To efficiently protect by special fire-mains the whole of the property within the city, no matter where situate, would cost a very large sum of money indeed. If special fire mains are to be laid in Idle and Bierley, the probable cost will be: Idle, £2354, and Bierley, £4639, or a total of practically £7000; and the question is, How is the money to be raised? By this expenditure the revenue of the Water Committee would not be added to by one penny; and it is only fair that such costs should be met and defrayed by a rate laid over all the property in the city. No doubt insurance companies would welcome such a rate and such expenditure, which would be largely in their interest. Would they subscribe to the huge expenditure, or remain as now much favoured beneficiaries? There is no difficulty outside that of finance in laying fire-mains all over our area of supply, though many of them might not be used once in twenty years. Making such provision would, however, be a dead-loss to the water undertaking.

WATER SUPPLY OF LIVERPOOL.

The Work of the Year.

Following his usual practice, Alderman Burgess, at the final meeting for the present municipal year of the Liverpool Water Committee (of which he is Chairman), in acknowledging a vote of thanks for his services, gave some account of the work of the past twelve months.

He said the progress of the undertaking continued to be in every way satisfactory. Within the compulsory area of supply, they had added 2533 new consumers. They supplied in that area 889,000 people with water; and the total population for which they provided water, either by administration or in bulk, was now estimated at 1,103,000. The total quantity of water distributed from the Liverpool Water-Works had been slightly less than in the previous years; the quantity this year being 9,656,792,000 gallons, or 202,211,000 gallons less than the year before—being an average decrease of 3,889,000 gallons weekly. It was, however, satisfactory to know that the consumption, both for general trade and for shipping requirements, steadily grew; the quantity used for trade and manufacturing purposes being 54,177,000 gallons, and for shipping purposes 15,683,200 gallons, greater than in the preceding twelve months. The quantity of water sold in bulk by meter along the lines of the Vyrnwy and Rivington aqueducts had increased by 125,456,000 gallons—that was to say, about 2,500,000 gallons weekly—largely caused by the fact that Runcorn had recently taken advantage of its right to a supply from Vyrnwy. The quantity of water used for sanitary and other public purposes during the year 1905 was 564,011,000 gallons; and of this more than 327,000,000 gallons were used by the Health Committee for sanitary purposes. It was not without interest to observe that, while only 12,000,000 gallons were used in 1897 for washing streets and flushing gullies, more than 100,000,000 gallons were delivered for the same purposes last year. There could be little doubt that this had been productive of great benefit to the health of the city. The total length of new mains laid during the year in and around the city was 14¾ miles. A few days after their final meeting last October, the second line of pipes from Lake Vyrnwy was completed, and the water was brought through into Liverpool. It was a memorable achievement, very successfully

accomplished; and too much could not possibly be said for the manner in which the work was done by the Chief Engineer, Mr. Parry, and those who were associated with him. It cost very considerably less than the estimate; and more than 19,000,000 gallons per day had been brought through the pipe.

Having dealt with the other works accomplished or in progress, Alderman Burgess referred to the finances. When the second line of pipes from Vyrnwy was sanctioned by the City Council, in 1901, the domestic water-rent stood at 7½d. in the pound; and he told the Council that they could see their way to incur the cost of the second pipe without increasing the water-charges. They had for some time been accumulating a reserve fund; and he felt that by the time this fund was exhausted, though the new main would cost them £33,000 a year, the increase of revenue would enable them to do without an increase in the charges. Unfortunately, the increased cost of other departments made the Council cast hungry eyes on the Committee's nest-egg; and in 1894 the domestic water-rent was reduced to 6d., and then again in 1905 to 4½d. This year it had been raised to 6d.; and they would be very fortunate if they could keep it at that figure. The loss of revenue to the Committee caused by the reduction in the domestic water-rent during the last three years had been at least £64,000, which was rather more than the entire revenue of the domestic water-rent for one year in the city area. Fortunately, their income from other sources had been expanding. The amount received from meter-supplies—principally for trade purposes—had increased since 1899, when he became their Chairman, from £69,250 to £83,124; and the payments from shipping had gone up from £19,061 to £31,871. The aggregate revenue from all sources increased from £283,835 in 1899 to £311,071 in 1905; and with the 6d. water-rent, it might perhaps reach £325,000 this year. Though the charges for trade and shipping purposes now compared very favourably with those made in other places, he was strongly of opinion that these should be the first to benefit when a reduction became possible. He wished to take the opportunity of expressing his sense of the excellent work done for the city by the whole of the officials connected with the undertaking. Of Mr. Parry it was impossible to say all he would like to. He never spared himself. They were also much indebted to the Deputy Town Clerk, Mr. Pierce, who had had much additional work to do on behalf of the Committee during the purchase of the Rivington watershed and the construction of the new Vyrnwy pipe-line.

During the seven years of his chairmanship, Alderman Burgess added, they had laid the Wallasey pipe-line, more than doubled the storage capacity at Prescot, largely increased the filtration works, made the Cowny tunnel, and almost completed the Marchnant tunnel. They had also protected the Rivington gait, purchased the Rivington watershed, and successfully completed the second main from Lake Vyrnwy; and the water-charges were lower to-day than they were before all this was done. It was a record which might make them feel that their opportunities of doing some work for the city had not been neglected, and every member of the Committee had shown the deepest interest in the work.

TORQUAY'S COSTLY WATER SCHEME.

Our local correspondent sends us the following observations on the above subject: While an abundant supply of pure water is recognized as an absolute necessity in a place which is absolutely dependent upon its reputation for healthiness, Torquay appears to feel some doubt as to whether even this great need cannot be supplied at too high a price. If the new loan of £14,400 now applied for is sanctioned by the Local Government Board, the borough debt on water-works account alone will amount to over £193,900. It is true that, unlike some municipal expenditure, this outlay may be classed as remunerative; but it is equally true that the liability for the payment of interest and sinking fund on so large an outlay must continue to be felt as a serious burden for many years to come. A good deal of the expenditure was wisely incurred. Although it brought no direct return, it was a prudent thing for the Corporation to purchase, as they did some years ago, the land constituting the water-gathering area which supplies its reservoirs, and to put an end to farming and other operations which were a possible source of contamination of the supply. But opinion in the town seems to be still divided as to the necessity for the new reservoir which was the subject of the recent Local Government Board inquiry. If this undertaking should be completed for the additional £14,400 now asked for, it will have cost, inclusive of the land and the parliamentary outlay, a sum of £57,000, as against £22,000 originally estimated. Accustomed as we are to seeing parliamentary estimates exceeded in actual practice, this is a serious and remarkable increase. Some of it is, no doubt, due to unforeseen causes; but when every allowance is made for these, it must be admitted that an inadequate view was taken of the expenditure that was likely to be incurred in connection with such work. The point, however, upon which opinion is divided in the town is whether the expenditure might not have been avoided, or at least deferred for many years, by the adoption of other expedients. One of these was the raising of the dam of the Kennick reservoir—one of the existing means of storage. This plan was seriously considered at one time, but was dropped in favour of the scheme now advancing towards completion. It would certainly have cost less, and might, it would appear, have provided all the additional storage needed to tide the town over dry seasons for a considerable time to come. The fact that more storage is required was strongly urged at the Local Government Board inquiry, and was held to have been proved by the experience of the dry period which has now come to an end. It is going a long way to say, though it is said, that the conclusion to be drawn from the abnormally dry summer we have had is that Torquay could have done very well in ordinary seasons without an addition to its storage of water. There are, however, water-works engineers who would have felt happy rather than the reverse if they had found themselves on the 30th of September with 18 days' storage in hand, as there was at Torquay on that date.

DEVONPORT CORPORATION WATER-WORKS.

It has recently been decided by the Devonport Town Council to take the necessary steps to promote a Bill in the ensuing session of Parliament for the purpose of obtaining powers to construct an additional storage reservoir and filter-beds at Crownhill, carry out certain extensions and improvements to the water-works, and borrow £80,000, the estimated cost of the works.

Alderman E. Blackall, the Chairman of the Water Committee, in explaining the scheme, said the Corporation were aware when they purchased the water property that it would be necessary at a very early date to take steps to improve and extend the works. The Water Engineer had prepared a careful report on the subject; and it was the intention of the Committee that the work which was required should be carried out under his direction. It was not proposed to employ the assistance of any outside experts. As to the cost, they would not for many years spend anything like the sum of £80,000. It was intended as quickly as possible to line the bed and sides of the leat with stone from the intakes on Dartmoor to Dousland, where it began to enter an inhabited district. From this point to the reservoir at Bellever, a pipe-line would be laid. The estimated cost of these works was £32,826; and the Council would agree that the substitution of a pipe-line for the open leat through Dousland and Yelverton was absolutely necessary to prevent the contamination of the water. With regard to the storage question, they had at present reservoirs which contained 15½ million gallons—which was equal to six days' supply. They had, however, at Crownhill land sufficient for the construction of a reservoir of 20 million gallons capacity, and the estimated cost of this was £30,000. An additional filter-bed and meter would cost £4500; and they had estimated £10,000 for general main extensions and improvements, bringing the total to about £80,000. It was hoped that Parliament would grant a period of sixty years for repayment of the loan for the reservoirs, and that forty years would be allowed for the pipe-line. Another matter which would be dealt with in the Bill would be the adjustment of the rentals and properties exceeding a value of £85 per annum. The present scale did not go beyond £80, for which £3 10s. was the rental payable. It was necessary to go forward with the work as quickly as possible. They had managed to maintain the supply during the past summer without having to purchase water from the Plymouth Corporation, as the Water Company had to do on several occasions; but the fact was that the rain came only just in time to keep up the supply. The waste of water was very considerable; and £500 was to be spent in repairing the leat, from which there was great leakage.

Alderman W. Hornbrook, in seconding the motion for the promotion of the Bill, remarked that the Committee were unanimous in regard to the recommendation.

Alderman W. J. Waycott said the Committee were satisfied that if the leat were repaired and a portion of it piped, the supply would be sufficient for several years, without the necessity of constructing another reservoir.

Alderman G. H. Smith, however, thought it important to have the reservoir first, so that they might have a good store of water.

Mr. J. C. Tozer recommended a modification of the proposals. The Chairman of the Committee had said that it was not intended to spend £80,000 for a number of years; but one knew that when they got powers for spending money they would not be happy until they had spent it. He believed that it was due to good management that they had been able to maintain the supply without assistance from Plymouth; and if they stopped a small part of the leakage, they would be able to save more than the equivalent of the 18 million gallons which the Water Company in previous years had to buy from Plymouth. In his opinion, they need not have an additional storage reservoir for a considerable time; while instead of spending £32,000 on paving and piping the leat, they might modify the scheme so as to give a full supply of water at considerably less cost.

Several other members expressed the opinion that the expenditure might to be curtailed, and suggested various modifications of the proposals.

The Town Clerk said the resolution to promote a Bill did not commit them to the expenditure of any portion of the £80,000; and between now and next August, when the measure would receive the Royal Assent, they could go into the details, and decide what portion of the scheme they would carry out.

Lighting of Tunstall Town Hall.

The Public Buildings Committee of the Tunstall Urban District Council, after carefully considering the question, unanimously decided (only one member being absent) to light the Town Hall by incandescent gas; the reason for this being that the extra cost of electricity was such as to preclude any idea of the adoption of that method of illumination. At present, flat-flame burners are in use; and it is calculated that the incandescent system will furnish twice the amount of light, while the gas bill will be halved. On the matter coming before the Council, several members expressed the opinion that the cost of gas and electricity would be much the same; while others agreed with the Committee's finding. Mr. Goodall said the Committee had gone minutely into the cost; and if they had the same light with electricity as with gas, the expense would be, not slightly different, but enormously different. The Burslem Corporation offered to supply the current at 5d. a unit; and if they had the same amount of light with electricity as with gas, the cost would be ten times as much. In addition to this, the cost of installation would be very heavy. At the conclusion of a lengthy discussion, it was decided to hold a special meeting of the Council to further consider the matter.

The Directors of the Monte Video Gas Company, Limited, have declared an interim dividend of 6s. per share, less tax, for the six months ending the 30th of June.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The second section of the Granton Gas-Works at Edinburgh was opened, as the report in the "JOURNAL" of Tuesday last said truly, in auspicious weather. The arrangements for the ceremony had been well settled; and, as a consequence, everything went off as was intended—nothing being omitted and nothing hurried. As the illustrations given in the "JOURNAL" show, the works are magnificent in appearance. That the same adjective may be applied to their work-a-day capacity, is borne out by the tables which are subjoined to the description of the works. Mr. Herring might well say that he felt honestly proud that the conclusion of his scheme for the provision of new works had been so successful. Everyone will agree that he has carried through a task of no ordinary sort with consummate skill, down to the minutest detail, and has attained a measure of success which throws criticism out of account, and which is the more striking when the low initial cost is taken into consideration. The Commissioners have put into their hands an instrument which will enable them to render the community a more effective service than has yet been in their power. The mind naturally turns to the contemplation of the question of whether they have chosen to go about this work at the right moment. In considering this question, no account need be taken of whether they could have undertaken it before they did, because no such scheme as the Granton one was possible until after the unification of the gas supply. This took place in the latter part of 1888; and it was but what was to be expected that the newly constituted Gas Commissioners would not cherish notions of laying aside the works which had hitherto served the community satisfactorily. The nine years of probation will not be grudged them; so we come to the consideration of the question of whether it would have been wise policy to have delayed entering upon the new scheme for some years, to allow of the reduction of the capital of the undertaking. One answer—a quite conclusive one—is that the Commissioners were in the hands of their Engineer, and that his advice has proved to have been founded on a sure basis. But there is a further aspect of the situation which is not covered by this consideration, and it is that ever since the new works were resolved upon, and their character and extent fixed, there have been developments in matters relating to gas supply; and bearing this in mind, it is evident that, under the old equipment, the gas undertaking would have been left in the unsatisfactory position of beating up in the rear. Now they are quit of the odium and the disadvantage of being the whipper-in in the race for communal service; and instead of striving after, they are waiting for, whatever openings may offer in days to come. And so it is to be concluded that, whatever might have been the present gain in following a policy of patching and maintaining the *status quo*, there is, as matters now stand, not only the present gain that is apparent to everyone, but a much more valuable, if not so clearly recognized, prospective gain visible in the great work which they have accomplished. Therefore, in doing what they have done, the view cannot be contested that they were wisely and timeously advised, and that the Commissioners wisely and timeously adopted the advice.

The Gas Commissioners on Monday completed the arrangements under which they for ever leave their old works, from which, for eighty years or so, gas was continuously supplied. On Tuesday morning they had a reminder that the discarding of the old works is not altogether an easy transaction. This was in the mention before Lord Ardwall, in the Court of Session, of the action against them at the instance of Messrs. James Muir and Son, Limited, with reference to the pollution of a brewery well. The Counsel for the Gas Commissioners described the action as a curious one, which it really is, in this respect, that the case which the pursuers sought to make was not established, and yet they obtained decree. We know that the pursuers were under the necessity of making out a new case, which required further proof on the part of the Gas Commissioners to meet it. The Gas Commissioners have been, ever since March last, sinking a well and are now driving a mine, in an endeavour to make out their contention that the pollution which is found in the pursuers' well does not come from the gas-works. These operations are not advanced enough to allow the proof to proceed on Oct. 30, the date fixed for it; and so the Commissioners were under the necessity of asking the Court to allow a postponement of the proof. The motion was opposed on behalf of the pursuers; and in their opposition the first ungracious word was uttered which has been heard in this now protracted litigation. It was that the Gas Commissioners were desirous of hanging up the case, with a view to allowing the pollution to diminish or cease, and then attaching the sum awarded. The Judge was not impressed with the argument, and allowed a postponement till January; but he observed that, "in his belief, or impression, nothing would make much difference to the case," which is open to the observation that he might have waited till he heard what the Commissioners may be able to bring forward before giving his impressions. It surely may be taken for granted that the Commissioners are finding some encouragement in their quest for the polluting material, or they would not seek to pursue it, at a cost which would inevitably fall upon themselves. The Commissioners have certainly an interest in endeavouring to show themselves in the right; but they and their advisers know perfectly well that if the facts, as ascertained by their own acts, are against them, they must accept responsibility for the pollution. How these facts may come out in the investigation we shall not know till January.

A very pleasant visit was made to-day by the Scottish Junior Gas Asscciation—Eastern District—to the gas-works of the Corporation of Dundee. The weather was bright and balmy, which could not be said of that of yesterday, as was testified to by snowclad mountain tops that were visible from the city. The Association received a hearty welcome to the works from Mr. Yuill and his assistants; and they spent a profitable afternoon—first in the works, and afterwards in the gas exhibition in the city. The works are a fine example of what can

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be done in the way of making new lamps out of old ones. About 1899 it was felt that the works were not of the capacity they should be, nor of that up-to-date character which would enable the operator to face modern competition. Additional ground was taken in, and plans for extensions and additions were prepared; the late Mr. William Foulis, of Glasgow, being consulted in the matter. The new works, as completed, necessarily bear the impress of that gifted gentleman's hand, and for equipment leave nothing to be desired. But it was not possible to make so complete an arrangement as would have been the case if the Corporation had been able to "scrap the lot." This was too much for accomplishment, presumably, considering the nature of the capital account. Whether it would have been advisable to have adopted that drastic policy need not be discussed here, as we are not familiar with all the circumstances; but it must be freely admitted that, having adopted the policy they did, the Commissioners have made as much of the situation as was possible. They have abundance and to spare in the meantime, and equipment which, at the ordinary rate of increase of the gas consumption, will carry them on, with little outlay, for the next seven years at least, probably longer, when the carburetted water-gas output is taken account of. It may be remarked that the work which has been executed is of so substantial a nature that the yearly expenditure upon renewals should be a small item indeed.

The gas exhibition in Dundee, which I referred to last week, is a larger undertaking than I expected to see on my visit there to-day. [An account of the exhibition appears in another part of the "JOURNAL."] There is much shown there which those acquainted with such matters have seen over and over again. This, however, does not detract from the value of the exhibition, which, it must be remembered, is not being held for the benefit of gas managers, but of the community. Such a display, say of lighting appliances, must have an educative effect upon the general public, who learn how easily and how cheaply they may improve the lighting of their dwellings. In a town like Dundee, where there are so many large spaces in mills to light, the education should extend to the manufacturing class. Thus, theoretically, the probability of benefit to be derived by the Gas Commissioners is wider than in towns where the community is much more of one class than it is in Dundee. The same remark may also be made of cookers. The larger sizes will appeal most to the better classes; while for the working man or working woman, of whom there are thousands in Dundee, only smaller pieces will be of interest. Heating appliances are different from the other two, in that only people of some means will look at them. On the recognition and application of these general principles a great deal of the after-success of the exhibition will depend.

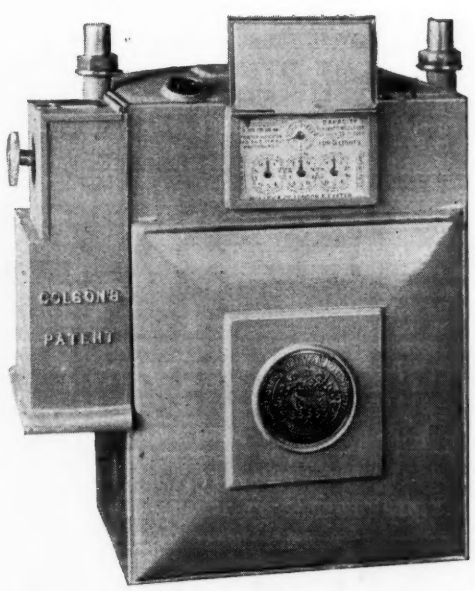
In dealing with their annual accounts, in July last, the Town Council of Dunfermline were recommended by the Auditor to make a change in the financing of the gas undertaking. The Gas Committee proposed to transfer £10,000 from the revenue account to capital account, to write down the book value of the works by this amount, and to borrow £6000 for the purposes of the undertaking. The proposal did not meet with favour in the Council, and it was resolved to hold a conference with the Auditor upon the subject. The matter has now been adjusted; and in terms of a minute approved by the Auditor, the Council, on Monday of this week, agreed to transfer £10,000 to a reserve fund, and to borrow a sum of £6000 from time to time for the purposes of the gas-works undertaking.

In my "Notes" last week, I referred to the appointment of a Committee of the Selkirk Town Council to consider the gas supply of the town, and to confer with the Directors of the Gas Company on the matter. The Company is a private one, with an output of 33 million cubic feet of gas a year. At the annual meeting of shareholders held at the beginning of July last, a profit of £1019 was reported, out of which dividend at the rate of 10 per cent. upon the original capital of £4535 was declared; £250 was applied to depreciation; and £315 was carried to surplus account. The smallness of the capital enables the high rate of dividend to be paid, and this, in turn, gives the notion that the Company is more than usually profitably worked. The action which the Council, upon the persuasion of the Treasurer, have adopted, is founded upon the ethical consideration that, there being profits, these should belong to the community. Would the converse, supposing it to be the situation, appeal with the same force to the Treasurer? There is the trace of a feeling in the Treasurer's mind that the Company, on account of its favourable position, should be easily taken over, whereas the opposite is really the case. The Company have spent upon their works money which they might have distributed among themselves, thereby keeping down the capital of the concern, which they are entitled to have taken into consideration. Add to this the fact that gas is sold at as low a price as 2s. 8½d. per 1000 cubic feet, and it will be evident that the Company occupy a very strong position. If the Council wish to acquire the undertaking, therefore, circumstances point in the direction of their requiring to make up their minds that they will have to pay a long price for it.

The Aberdeen Town Council are reported to have, on Monday, resolved to apply for parliamentary powers to reduce the minimum illuminating power of the gas they supply from 20 to 15 candles, "if and when the Council shall so determine."

The municipal buildings at Alloa, a handsome pile, on Tuesday night suffered serious damage by fire, which is believed to have originated in the fusing of an electric light wire.

On the statistics regarding the output of gas having been reported to the Falkirk Town Council on Monday, Mr. Russell, a former Convener of the Gas Committee, said there had been a Committee appointed to inquire into certain matters in connection with the gas-works, and he thought they might get power to inquire into the subject of the make of gas per ton of coal. The make was approximately 9487 cubic feet per ton, which, he thought, was a falling off. The explanation given of the Committee upon this point was that the decrease was due to efforts to get rid of naphthalene deposits in the main and service pipes. The subject was, however, by a majority, remitted to the Committee to take up with the other matters they are inquiring into; so more may be heard of the matter later on.



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CURRENT SALES OF GAS PRODUCTS.

Week ending Oct. 20.

The London market for tar products remains in about the same position as last week. Notwithstanding the scarcity of ships for the near Continent, large shipments of pitch are being made to other parts. The consumers abroad are not disposed at present to pay the equivalent of the nominal London price, but with a small concession orders could, no doubt, be obtained. Crystals carbolic are firm at 5¾d. Benzol, 90's, are worth 11d. net; also toluol is in an improving position. Creosote oil is in large demand, principally for the American market. Sulphate of ammonia is strong; the quotation being £12 10s. net for 25¼ per cent. for November-December delivery.

Sulphate of Ammonia. LIVERPOOL, *Oct.* 20.

The market has been very firm throughout the week, and towards the close values have improved at all points; the closing quotations being £12 per ton f.o.b. Hull, £12 3s. 9d. per ton f.o.b. Liverpool, and £12 5s. per ton f.o.b. Leith. There has been more direct inquiry, but buying has been mainly for covering October contracts; buyers abroad being slow about getting into line with current prices. November-December delivery is also in request, and the closing quotation in this position is £12 7s. 6d. per ton. Further business has been done for delivery over spring months at £12 10s. per ton, and £12 12s. 6d. is now asked, while for April-September £12 7s. 6d. up to £12 10s. per ton has been paid.

Nitrate of Soda.

This article maintains its firm position, and spot prices are 11s. 10½d. and 12s. 4½d. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *Oct.* 20.

The market for tar products has been fairly firm during the past week, with the exception of pitch, which has shown a decided tendency to drop, especially for delivery between now and the end of the year. In fact, business it reported on the east coast for January-March delivery at 28s., but only for a small quantity. Several manufacturers appear desirous of placing some quantity for delivery from now to the end of the year, but they cannot get satisfactory bids for it. It is reported that 28s. 6d. has been accepted for delivery on the east coast, and that very low prices have been taken both at Liverpool and Manchester. Orders from the Continent continue scarce; while South Wales buyers appear to be well covered for their present requirements. The market for creosote is very firm indeed. London manufacturers are practically sold out for this year's delivery, though second-hand oil could still be booked at fairly low prices. In the Midlands, 1¾d. is reported to have been paid at makers' works; while in the North business has been done at 1⅞d., and this figure has also been refused. Some manufacturers who are well sold ask 1¾d. to 2d. per gallon, which prices, however, they are unable to realize at present. Carbolic acid is firm for prompt delivery. Continental consumers are reported to have paid 1s. 9½d. for this month's delivery on the east coast; but for next year they are not prepared to do business except at a reduction on this figure. In crystals, there is practically no change in price; but a fairly steady business is reported to have taken place in 34-35 per cent. at 5¾d., and in 39-40 per cent. at 6d., several contracts having been renewed at these figures. Benzol is still firm. London makers now ask 11d. for delivery to the end of the year; but second-hand parcels are reported to have changed hands at 10¾d. In 50-90 per cent. there is no change. Manufacturers all round ask 1s. per gallon, but cannot realize this price. Solvent naphtha remains firm for both prompt and forward delivery. Some quantity is reported to have been sold in London for this and next month's delivery at 1s. 2d. per gallon; but for actual London makes, 1s. 3d. could probably be obtained. Heavy naphtha is still firm; and one or two important contracts have been placed for next year's delivery. In toluol prices remain unchanged at from 1s. 1½d. to 1s. 2d. per gallon.

The average values during the week were: Tar, 16s. 6d. to 20s. Pitch, London, 30s. 6d. to 31s. 6d.; east coast, 28s. to 29s.; west coast, 28s. to 29s. Benzol, 90 per cent., 10½d. to 10¾d.; 50-90 per cent., 11⅜d. to 1s. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d.; solvent naphtha, 1s. 2d. to 1s. 3d.; heavy naphtha, 1s. 2d. to 1s. 3d. Creosote, London, 2d. to 2¼d.; North, 1⅝d. to 1¾d. Heavy oils, 2⅜d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 9¾d. Naphthalene, £5 to £9 10s.; salts, 32s. to 32s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market for this article has been very firm throughout the week. The principal London Companies have practically nothing to sell for prompt; while for November-December, they ask £12 10s. Other makes, however, could be secured at under this figure. The market in Hull is firm for November, and it is reported that a fine make has realized over £12 5s. for prompt; while for November delivery best qualities command from £12 5s. to £12 6s. 3d. In Leith, makers have refused £12 5s., and now ask £12 7s. 6d.; while for forward delivery values are considerably higher. In Liverpool, £12 5s. paid is reported; and £12 6s. 3d. to £12 7s. 6d. is asked for best makes.

Gas-Works Results at Keighley.—There was, for the year to June 30, a gross profit on the Keighley Gas-Works of £15,048, against £17,250 the previous twelve months. After meeting interest on loans, sinking fund, renewals, &c., amounting to £8308, there remains a balance of £6740, which, added to the balance of profit from the previous year, leaves a surplus of £10,739. The Committee recommend the apportionment of this sum as follows: Transfer to rates, £5276 (the previous year £6002); subscription to Keighley Victoria Hospital, £50; transfer to renewals account, £964; to carry forward, £4000.

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Blackburn	1,250,000	Winnipeg, Man.	500,000	Malton	150,000
Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Devizes	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	50,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Not all the Lancashire colliery owners have fallen in with the generally concerted rise of 10d. per ton in the price of house coal. The market remains steady at last quotations. Some movement is expected among the operative miners at the end of the year in the matter of wages. At a meeting of the General Wages Committee of the South Wales Miners' Federation last Friday, it was decided to apply for an advance of wages in November, concurrent with the abolition of the coal tax. Reports from the West Yorkshire coalfields are very satisfactory. The house coal pits are working extra time.

Northern Coal Trade.

The coal trade is now more irregular than it was, because the nearness of the termination of the coal tax is influencing for the time the exports of coal. There is, however, a good home demand; and the production may be said to be fairly well taken up on the whole. Best Northumbrian steams are 10s. 4½d. to 10s. 9d. per ton. f.o.b., according to the time of delivery; second-class steams vary from 9s. 9d. to 10s.; and steam smalls are rather scarce at from 6s. to 7s. Collieries are not working quite so briskly at present, for the reason indicated above. In the gas coal trade, the consumption is now very heavy; and while the exports are a little kept back until the end of the tax, the home deliveries are very full, and the range of the shipments is quite an average for this time of the year. Durham gas coals vary from about 9s. 10d. to 11s. 3d. per ton f.o.b., according to quality; and the best classes seem to be a little scarce, though those of other kinds are still plentiful. One or two additional contracts have been placed for gas coals for shipment, at something near the current prices; but the quantities are not large. The coke trade is brisk; and gas coke is quoted at from 12s. to 13s. per ton f.o.b., according to kind and place of shipment.

Scotch Coal Trade.

There is a better tone in the market; inquiries for forward delivery being more numerous, with a disposition to higher prices. Orders for current delivery are plentiful. As a consequence, there is every probability of prices going up in the near future. The quotations are: Ell 9s. to 10s. per ton f.o.b. Glasgow, splint 9s. 9d. to 10s., and steam 8s. 9d. to 9s. The shipments for the week amounted to 270,625 tons—a decrease of 4876 tons upon the previous week, and of 11,593 tons upon the same week of last year. For the year to date, the total shipments have amounted to 10,856,654 tons—an increase of 1,230,448 tons upon the corresponding period of 1905.

Electric Lighting at Watford.—We learn from the "Local Government Journal" that the Watford Urban District Council intend to apply for sanction to borrow £13,500 for improving the electric light undertaking. No less a sum than £80,000 has already been laid out on the scheme; and at the forthcoming Local Government Board inquiry considerable opposition is promised—a majority of the Council having expressed their intention to endeavour to prevent the granting of the loan. They are probably not impressed with the performance of the light, an example of which was recorded in the "JOURNAL" for the 9th inst. (p. 123).

The Standard Oil Company in Trouble.—After 32 hours' deliberation, the Jury in the trial of the action brought by the State of Ohio against the Standard Oil Company, particulars of which have reached England from time to time, returned against the Company a verdict of guilty of conspiracy to restrain trade since July 6, 1903. Under the Ohio law, each day's business constitutes a separate offence, punishable by a fine not exceeding $5000. Persons convicted under the statute are liable to imprisonment as well as to a fine. It is stated that the personal case against Mr. John D. Rockefeller will be allowed to await the result of the appeal to the Higher Courts in the Company's case.

Pontypool Water Supply.—The question of the water supply has been receiving the consideration of the authorities at Pontypool, and a scheme has just been drawn up which will involve the purchase of a site on the Usk side of the Wentwood watershed, which belongs to the Corporation of Newport. In years past, this site was surveyed by the Newport Water Company, and was declared by experts to be an ideal one for water-works, as it is high, and the water is both pure and plentiful. It is suggested that if the site can be secured now, the water supply will be ample for the whole of the valley from Usk to Pontypool. It is feared, however, that objection may be raised by the Newport Corporation, who, in view of the continual developments in the Uskside town, may have at no distant time to increase the supply, and who at moderate cost, by the boring of a tunnel, would be able to connect the proposed site of the Pontypool works with the existing service.

The Disastrous Fire at Selby Abbey.—News reached London on Saturday of the destruction by fire of the venerable abbey at Selby, which was founded by William the Conqueror; and the cause of the disaster was conjectured to have been an escape of gas from the engine installed to drive the blowing apparatus of a new organ which had just been completed, and on which workmen were engaged until within an hour of the outbreak. We learn, however, from the Gas Engineer and Manager to the Selby District Council (Mr. T. H. Alderson) that there is no truth in the report that the fire was caused by gas. It is supposed to have originated in the organ; but nothing definite is at present known. A report was also circulated to the effect that an explosion of gas occurred during the fire. Mr. Alderson informs us that this also is untrue. As soon as the alarm was given, a gasfitter who had done work at the Abbey, and was, of course, acquainted with the gas arrangements, at once made his way to the meter and turned off the tap, which had been left on for the organ builder's workmen. Mr. Alderson also sent some men to cut off the gas-engine service-pipe at the main, and had a syphon on the lighting service flooded in case the fire should reach the meters. The fire is a national calamity; and it is gratifying to learn that not only was gas not the cause of it, but that the promptest action was taken to prevent any attendant damage which an escape resulting from the fire might have caused.

THE

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"CRYSTAL LIGHT"

GAS FIRE

OUR VERY LATEST.

Fitted with attachment to Burner which allows the fires to be regulated "*in situ*" (no tools required) to suit varying pressures, and where water gas is used perfect combustion is ensured.

Supplied in 8 colours of "Majolica" porcelain enamel finish, and also in Copper Bronze, Art Bronze, and Armour Bright.

Catalogue and full particulars on application to—

Carron Company

INCORPORATED BY ROYAL CHARTER 1773

Works: CARRON, STIRLINGSHIRE.

Reported Explosion at Beckton.

Many people were no doubt startled, on opening their evening papers last Friday, to see therein a report of a "Beckton Gas Explosion." One of these statements was in the following terms: "Several men are in the Seamen's Hospital at Greenwich suffering from injuries sustained in an explosion which occurred this afternoon at the Beckton Gas-Works, in the purifying department. The accident is supposed to have been due to the presence of gas in a vessel in which men were working. The men were lifted off their feet, and thrown to the ground. Most of the injured men reside at Barking. Those most seriously injured are John Dawson, Arthur Lomas, and W. Corrins. These men are suffering from severe burns about the face and arms. Many others had narrow escapes. It is eighteen years since any serious explosion occurred at the Beckton Gas-Works, the central factory of the Gaslight and Coke Company of London, and perhaps the largest and most important gas-works in the world." Anxious to secure authoritative information with regard to the serious mishap here depicted, we applied at the Company's Head Office, and were informed that there was no explosion at all at Beckton on the day mentioned. A week and more ago there was a slight accident caused by a flare-up in connection with one of the purifiers, by which two or three men were slightly burnt, but none of them were "seriously injured."

The Marylebone Electric Lighting Case.

On Saturday, the 13th inst., Mr. Bell, Solicitor, attended before Mr. Plowden, on behalf of the Marylebone Borough Council, and drew attention to a case heard by him the previous Wednesday (*ante*, p. 190), when the Council were fined £50, with £10 10s. costs, for failing to maintain a supply of electric energy to the premises of Messrs. Mappin and Webb, Limited, in Oxford Street, sufficient for the use of the firm. It was at the time also stated that, if there were future defaults, there would be a continuing penalty of £2 a day. Mr Bell now contended that the Magistrate had no power to impose a penalty for a prospective offence, and that this part of the decision could not, therefore, be enforced. A gentleman representing Messrs. Mappin and Webb said he was afraid this was so, in view of the case of *Chepstow Gas Company v. Chepstow Electric Light Company*,* which had been shown to him by Mr. Bell. Mr. Plowden observed that, if both sides were agreed on the point, no attempt would be made to enforce it. Messrs. Mappin and Webb's representative then asked that the whole of the penalty imposed should be handed over to the firm, subject to anything in the Act which might prevent this course being taken. Mr. Plowden acquiesced, remarking that, as they had suffered pecuniary loss, they ought to be recompensed.

* See "JOURNAL," Vol. LXXXVI., p. 972; also Vol. LXXXVIII., p. 413.

Further Extensions at the Christchurch (N.Z.) Gas-Works.—We learn from the "Lyttelton Times" of the 3rd ult. that the Christchurch City Council have informed the Gas Company of their decision not to proceed further with the proposed purchase of the Company's undertaking, which has been under consideration for the past year. In view of this decision, the Directors have decided to proceed with a new retort-house, and to instal stoking machinery, coal and coke conveyors, &c. The Engineer (Mr. R. English, F.C.S., M.I.Mech.E.) has been occupied for some months in completing working drawings and specifications for such a plant; and they have been forwarded to England. The total cost of these proposed works and additions will entail an expenditure of about £40,000; and to provide for this outlay the Directors have called up £40,000 of additional capital.

A Successful Amateur Water Diviner.—Some interesting experiments in finding water by means of the divining-rod have recently been carried out in Essex. Mr. J. H. Tritton, the President of the London Association of Bankers, is the proprietor of the Lyons Hall Estate, situate in the centre of the county, between Braintree and Chelmsford, and, in company with other Essex landowners, he experienced a difficulty during the past summer in providing his farms with water. Although he expended a large sum in endeavouring to provide a water supply, all the efforts ended in failure. Recently he was led to communicate with Mr. H. W. Golding, a Braintree manufacturer, who has practised water divining as a hobby, and has attained considerable success. Mr. Golding visited the farm, and experimented with a hazel twig. He indicated a spot within a few yards of where a pit 80 feet deep had been dug, and foretold the finding of water within 15 feet of the surface. Mr. Tritton subsequently took the diviner to four other places—three upon farms and one beside his labourers' cottages—and in all cases spots were indicated and marked with pegs. Boring was commenced, and in all the places specified an abundant water supply was tapped shortly after the ground was broken.

West Gloucestershire Water Company.—The report adopted at the half-yearly meeting of the West Gloucestershire Water Company stated that, during the six months ended Aug. 25 last, 131 additional services were laid on, making the number of houses and other properties supplied by the Company at that date 9890, which, together with some meter and miscellaneous supplies, are estimated to produce a water-rental of £9428 per annum. To this total must be added about £200 for rent of property, and the sum of £372, which approximately represents the difference between rates received on new supplies and the original estimated revenue of same, making a total estimated annual income on that date of £10,000. Extensions of mains in various parts of the district were carried out during the half year. An additional engine and pumps have been erected at Old Sodbury, and the old engines and pumps thoroughly overhauled. The engines and pumps are now in duplicate. The accounts for the half year showed that, after paying all working expenses and interest on debenture stock, there was a net profit earned of £3072, which, with the £125 brought forward from the last balance-sheet, made a total of £3197 available for distribution. The Directors recommended the declaration of a dividend (less income-tax) at the rate of 4 per cent. per annum, for the six months, upon the 10 per cent. shares, and £2 16s. upon the 7 per cent. shares. This will absorb the sum of £3125; leaving a balance of £72 to be carried forward.

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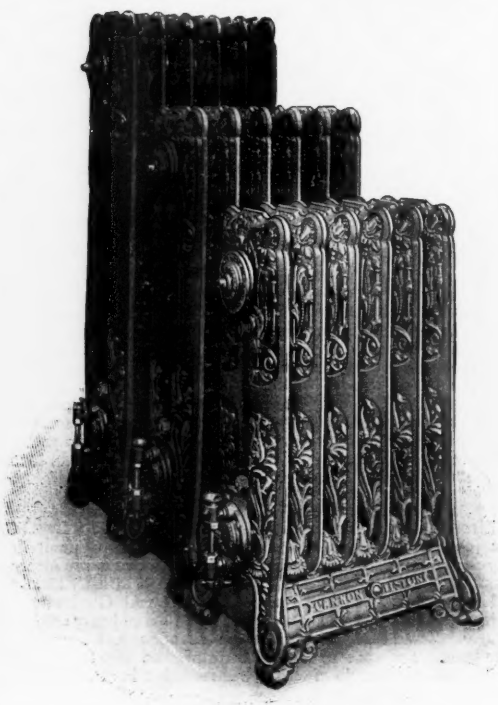
GAS-HEATED

STEAM RADIATORS



The "EQUATOR."

Specially adapted for:—

SHOPS, HALLS, CHURCHES, PUBLIC BUILDINGS, &c.

May be used with or without Flue Connection as most convenient.

Fitted with Automatic Gas Valve, to maintain an even temperature and economize gas.

Also fitted with Automatic Air Valve.

ECONOMICAL. DURABLE. SAFE.

Illustrated Lists free on application.

CANNON IRON FOUNDRIES, LD.,
DEEPFIELDS, Nr. Bilston, Staffs., Eng.

London Office and Show-Rooms:
Bath House, 57-60, Holborn Viaduct, E.C.

Australasian Agents:
JAMES HURLL & CO., Ltd., 20, Loftus Street, SYDNEY,
and Box No. 4 (G P.O.) Dunedin.

Water Supply in South Lincolnshire.—The Sleaford Rural District Council have decided to carry out a combined scheme for the supply of water to the parishes of Billinghay, North and South Kyme, Walcot, Thorpe Tilney, Timberland, and Martin, in accordance with recent recommendations received from the Local Government Board. The plans have been prepared by the Surveyor, Mr. W. B. Marsden; and the estimated cost is £10,750.

Cowes Water Supply.—The Cowes Urban District Council have resolved to apply to the Local Government Board for authority to borrow £925 to improve the water supply. The scheme involves the division of the district into high and low level zones, by which the expense of lifting a larger quantity of water than is necessary into the high-level tank, as well as keeping undue pressure on the pipes and fittings, will be avoided. Ample pressure will be provided for each zone; and in case of necessity, it will be possible to let down the water from the higher to the lower zone through a system of division valves. New mains will have to be laid in order to carry out the scheme.

Penrith Water Scheme.—With one dissentient, the Penrith Urban District Council have decided to promote a Bill in the next session of Parliament to enable them to carry out the gravitation scheme upon which, as was mentioned in last week's "JOURNAL," Mr. Baldwin Latham has reported. The source is Hayeswater Tarn, in the High Street range of Westmorland hills. The analysis shows the water to be ideal in quality; and the scheme presents few engineering difficulties. The Earl of Lonsdale's Trustees are understood to be willing to negotiate with the Council, so that no trouble is expected in obtaining the necessary rights. Mr. Latham put before the Council two projects, one to cost (exclusive of land, engineering, and legal charges) £25,000, and the other nearly £40,000. The Council decided to adopt the cheaper and more direct route.

Ceara Gas Company, Limited.—In the report to be presented at the annual general meeting of this Company on the 26th inst., the Directors state that the loss by fire at the offices and stores at Ceará (mentioned in a circular issued early in the year), including the legal and other expenses, amounted to £3994, leaving the net profit £2454. This, added to the balance brought forward, gives a total of £6504. Deducting the interim dividend paid in April last (£1388), there remains £5116 available for distribution. Out of this the Directors recommend the payment of a dividend for the six months ended the 30th of June of 5 per cent. on the preference shares (less income-tax), and of 4 per cent. on the ordinary shares (tax free); making together £1958. These payments, with the interim dividend already paid, will make 10 per cent. on the preference and 6 per cent. on the ordinary shares for the year. The balance carried forward will be £3128.

Birkenhead Ironmongers and the Gas-Stove Business.—At the last monthly meeting of the Liverpool Ironmongers' Association, Mr. Mawby made a report upon the question of the trade in gas appliances in Birkenhead. He said he had endeavoured to ascertain how the Corporation had fared in their trade in gas-stoves, and had obtained a copy of the abstract of accounts; but it did not help him very much. He found that £3000 had been written off for depreciation on gas-stoves and appliances; but whether this was the total loss he could not say. It was an opinion prevalent in Birkenhead that there had been a loss of £3000 on this business; and he thought this should be a strong inducement to the Corporation to hand over the trade in gas-stoves and appliances to the ironmongers, who, being spread over a greater area, were able to make a better display than the Corporation with a single show-room. He had contemplated convening a meeting of the Birkenhead members, and they could appoint a deputation to the Gas Committee afterwards. It was agreed to take steps to arrange a meeting, as suggested.

Birmingham and the Water Supply of Coventry.—For some time past the Coventry authorities have been considering the provision of an additional water supply; and now terms have been agreed upon between them and the Birmingham Corporation (subject, of course, to confirmation by the two Councils, and ratification by Parliament) for a supply from the Shustoke reservoir. The Birmingham Corporation are still making use of the Shustoke water, but contemplate dispensing with it in the course of a few years, and they can now dispose of such a quantity as will, with existing resources, meet the needs of Coventry for many years to come. The carrying out of the agreement will necessitate the laying of water-mains from Shustoke to Coventry, a distance of about 14 miles; and Birmingham will deliver to the Coventry reservoirs at Coundon not exceeding 2 million gallons of water per day, as may be required. The price is to be 4d. per 1000 gallons, subject to a minimum charge of £1250 per quarter; and the supply is to be for a period of 40 years. The cost to Coventry of laying the necessary main is estimated at £40,000.

The Kettle, &c. (Fifeshire) Gas Company have had recently erected at their works at Kingskettle, by Messrs. Henry Balfour and Co., Limited, of Leven, a tar-extractor capable of dealing with 100,000 cubic feet of gas per day.

The Gas Department of the Bakewell Urban District Council have recently instructed the Richmond Gas Stove and Meter Company, Limited, to undertake the complete supply and fitting up in their district of automatic meter installations, including cooker, meter (George Glover's make), pendant, brackets; also the supply of ordinary cookers for hiring out. The Company are to hold an exhibition, canvass the district thoroughly, and obtain the necessary orders for installations.

A profitable visit has been paid by the members of the local Cotton Spinning Mutual Improvement Society to the Rochdale Gas-Works, under the guidance of the Engineer and Manager, Mr. T. Banbury Ball, who described at length the various processes carried on in the manufacture of gas. He explained the difference between the water-gas plant and the ordinary coal-gas system, and how impurities are removed from the gas; and he also gave his visitors a clear insight into the working up of the bye-products.

THE SLOT GAS FIRE.

The "WIZARD."

Special Black Finish - - 25/-

The "Wizard" is in the full tide of success.

It has commanded the enthusiastic approval of Gas Experts.

It is being adopted for Slot purposes by Gas Authorities all over the Country.

JOHN WRIGHT & CO.,
ASTON, BIRMINGHAM.

The Directors of the Colonial Gas Association recommend a final dividend of 3 per cent., making 5 per cent. for the past year. The sum of £250 is transferred to the reserve, leaving £768 to be carried forward.

Accounts published last Wednesday show that there was a deficiency of £2615 on the first year's working of the Acton District Council's electricity undertaking. The outlay to date amounts to £51,547.

At the Talbot Hotel, Notting Hill, last Tuesday morning, the proprietor was found dead in the kitchen, with his head in a gas-oven. The doctor who was called in stated that death had taken place some hours previously.

The electricity undertaking of the Poplar Borough Council during the past year resulted in a surplus of £600. Although private lighting has not increased to the extent estimated, it is anticipated that the free-wiring powers possessed by the Council will give an impetus in this direction.

The Falkirk Corporation have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a steel tank 154 ft. 6 in. in diameter and 30 ft. 6 in. deep, with a two-lift gasholder, prepared for three-lifting, complete with concrete foundations, inlet and outlet pipes, &c.

The Hardy Patent Pick Company, Limited, of Sheffield, have just introduced a new patent automatic coutinuous feed for disintegrators, &c. It is intended to meet the demand for a feed to deal satisfactorily with materials such as small coal, which do not clog or stick in the serrations or pockets of feeds. It consists of a revolving internal drum or barrel, having conical pockets round its periphery from edge to edge, and arranged in a spiral or worm form. The material is fed into a hopper fixed to the top of the feed-drum, and is carried by a revolving action to the discharge opening—fitted at the bottom of the drum-box—and is then discharged into the mouth of the grinding machine in a steady and continuous feed.

An order has been received by the Premier Gas-Engine Company, Limited, from Messrs. Alfred Hickman, Limited, of Bilston, for what is believed will be the largest gas blowing-engine in existence—certainly by far the largest in the United Kingdom. It will have a capacity of 40,000 cubic feet of free air per minute; and it will be run with blast-furnace gas.

An interesting record of gas lighting in Exeter in the early part of last century has just been discovered. In connection with alterations to business premises in High Street, it became necessary to remove a stout oak post which supported one of the beams. This post was found to be covered with bills several layers in thickness. By the aid of water, the bills were detached, when they were found to relate to events in 1822 and the years immediately following. In December, 1823, there was an explosion of gas in the gallery of the theatre. This appears to have caused considerable alarm. Accordingly, the proprietor issued a notice that there was not the slightest danger, nor were the Gas Company in any degree blameable. The escape was from a leaden tube, which was most unsuitably placed. All danger would be prevented, the bill stated, by the use of iron tubes properly arranged.

The members of the Isle of Wight Liberal Club were alarmed, a few evenings since, by a loud report proceeding from the entrance. A rush was made to the door, and flames shot up the flight of stairs. The occupants quickly made their exit. The electric wire behind the front door was discovered to be ablaze, and a succession of explosions followed. Mr. Hollis, the caretaker, telephoned to the electric light works for instructions, and Mr. Mayes, the Manager, advised him how to cope with the difficulty. Acting promptly on this information, a quantity of sand was procured, which was successfully thrown on the ignited metal. Meanwhile the electric current was switched off at the works. The fire originated at the main fuse box, and it was supposed had been caused through the wet weather. Users of electric light might find it advisable to have a supply of sand on their premises to deal with such accidents as this.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT ENGINEER. Bristol Gas Company.
FOREMAN. No. 4670.
GENERAL CLERK. Bridlington Gas Company.
GAS COLLECTOR AND CLERK. Pontycymmer Gas-Works.
WORKS FOREMAN. Birmingham Gas Department. Applications by Oct. 31.
GAS FITTERS. No. 4671.
GAS FITTERS. Reading Gas Company.

Situations Wanted.

ASSISTANT ENGINEER OR MANAGER. No. 4661.
DRAUGHTSMAN OR ASSISTANT-MANAGER. No. 4667.
SECRETARY OR ASSISTANT SECRETARY, &c., TO WATER COMPANY. No. 4659.
REPRESENTATIVE. No. 4672.
TESTING METER INDICES. No. 4668.

Irish Exhibition, 1907.

APPLICATIONS FOR LIGHTING. F. T. Cotton, Dublin.

Gas-Works (Complete) for Sale.

No. 4666.

Plant (Second-Hand) Wanted.

PURIFIER. Cowdenbeath Gas Company.

Company Meeting.

CEARA GAS COMPANY. London Offices, Oct. 26. One o'clock.

Stocks and Shares.

BOURNEMOUTH GAS AND WATER COMPANY. Nov. 1.
CHICHESTER GAS COMPANY. Oct. 30.
DENBIGH WATER COMPANY. Nov. 1.
GRAYS GAS COMPANY. Oct. 30.

Stocks and Shares—(*Continued*).

HORNSEY GAS COMPANY. Oct. 30.
ILFORD GAS COMPANY. Nov. 13.
SOUTHEND WATER COMPANY. Nov. 13.
WHITLAND AND DISTRICT WATER AND GAS COMPANY.

TENDERS FOR

Fire-Clay Goods.

NELSON GAS DEPARTMENT. Tenders by Nov. 14.
SHEFFIELD GAS COMPANY. Tenders by Nov. 5.

Gasholder (Telescoping).

NORTH ORMSBY GAS COMPANY. Tenders by Nov. 7.

Pipes and Specials, &c.

UXBRIDGE GAS COMPANY.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 229.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20½—21½*	..	4 17 8
245,112	10	,,	7½	Do. 7 p.c.	14—15*	..	5 0 0
200,000	5	May 11	7	Bomb'ay, Ltd.. . . .	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne- 10 p.c. . .	28—29	..	4 16 7
51,810	10	,,	7	mouth Gas B 7 p.c. .	16¾—17¾	..	4 1 3
53,200	10	,,	6	and Water Pref. 6 p.c.	15½—16½	..	3 12 9
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260—265	..	4 14 4
300,000	,,	,,	9½	Do. New . . .	198—203	..	4 13 7
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	103—106	..	3 15 6
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	230—235	..	4 15 8
246,320	,,	,,	8½	Do. A. Ord. Stk. .	163—168	..	4 18 3
260,000	20	Sept. 27	10	British	4⅞—4¾	..	4 16 5
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c. .	120—124	+1	4 16 9
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—93	..	4 16 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd	12—12½*	..	5 12 0
250,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref. .	9¾—10¼	..	4 7 10
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk	98—100	..	4 10 0
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord. . .	108½—110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk. .	112—114	−1	4 11 3
560,000	,,	,,	5	Do. 3½ p.c. do. .	110—112	..	4 9 3
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
600,000	Stk.	,,	6⅔	Continental Union, Ltd.	122—125	−1	5 4 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
432,070	Stk.	Aug.	5⅔	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk. . . .	105—107	..	3 14 9
486,900	10	July 27	11	European, Ltd. . . .	24—25	..	4 8 0
354,660	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas- 4 p.c. Ord. . .	96—98	−1½	4 9 9
2,600,000	,,	,,	3½	light 3½ p.c. max. .	88—90	..	3 17 9
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	106—109	−1	3 13 5
4,193,975	,,	June 14	3	Coke 3 p.c. Con. Deb.	84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½*	..	5 7 4
940,000	Stk.	May 11	8	Imperial Continental .	186—189	..	4 4 8
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c. .	120—125	..	4 16 0
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	107—109	..	3 13 5
561,000	Stk.	Aug. 30	10	Liverpool United A . .	230—232	..	4 6 2
718,100	,,	,,	7	Do. B. .	67½—69½	..	4 2 7
144,140	Stk.	Sept. 13	7⅞	Maidstone 5 p.c. . .	145—1 0	+2	5 1 8
75,000	5	June 28	5	Malta & Medn., Ltd. .	4¼—4⅝	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb..	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	00—102	..	4 8 3
541,920	20	May 31	3½	Monte Video, Ltd. . .	11½—12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅜	Newc'tle & G'tesh'd Con.	111—113	+1	4 1 10
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	May 11	8	Oriental, Ltd. . . .	152—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd. . . .	5⅞—6¼	..	5 12 0
398,490	5	Apl. 26	7	Primitiva Ord. . . .	7⅛—8	+⅛	4 7 6
796,980	5	July 27	5	Do. 5 p.c. Pref.	5—5¼	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
851,070	10	Oct. 12	7	River Plate Ord. . . .	12½—13*	..	5 7 8
300,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	13⅞—14½	−⅛	5 12 3
70,000	50	July 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Sept. 13	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,500	,,	,,	10	Do. C	243—245	..	4 1 8
70,000	10	May 31	10	South African	16—17	..	5 17 8
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	130—132	−2	4 3 4
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	85—87	..	3 9 0
201,720	Stk.	Sept. 13	8	South Shields Con. Stk.	156—158	..	5 1 3
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	123—126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128—133	..	3 15 2
502,310	Stk.	May 11	5	Southampton Ord. . . .	107—112	..	4 9 3
120,000	Stk.	Aug. 30	6½	Tottenham A 5 p.c. .	125—130	..	5 0 0
588,020	,,	,,	5	and B 3½ p.c. .	103—105	..	4 15 3
137,500	,,	June 28	4	Edmonton 4 p.c. Deb.	103—105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	104—106	..	4 14 4
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	105—107	..	4 13 6
30,000	Stk.	Aug. 15	8	Wands- A 5 p.c. . .	—	..	—
255,636	,,	,,	6⅔	worth B 3½ p.c. . .	137—142	..	4 11 7
75,000	,,	,,	5⅝	and C 3½ p.c. . .	113—115	..	4 17 5
79,416	,,	June 28	3	Putney 3 p.c. Deb. Stk	82—85	..	3 10 7
279,875	,,	Aug. 15	5½	West Ham 5 p.c. Ord.	104—106	..	4 16 6
185,000	,,	,,	5	Do. 5 p.c. Pref. .	120—123	..	4 1 4
193,300	,,	June 28	4	Do. 4 p.c. Deb. Stk.	103—106	..	3 15 6

Prices marked * are "Ex div."